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Gillette Publishing Co., 22 West Maple St., Chicago 10, Illinois • Accepted as Controlled Circulation Publication at Milwaukee, Wis.

Heavy drill rig helps blast away a cliff . . . 25

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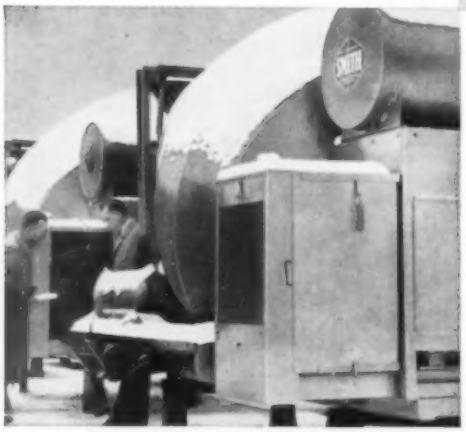
August 1958

why T. L. Smith Co. powers with Chrysler Industrial Engines

T. L. SMITH EXECUTIVES, Richard R. Kupfer, Director of Purchases (left); Raymond W. Mueller, Project Engineer, inspect Chrysler Ind. 30 Engine which powers all T. L. Smith separate engine mixers—nine models, 5 to 9 yard capacity.



SEND for 1958 CHRYSLER INDUSTRIAL ENGINE CATALOG: Dept. G8, Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.

Ready-mix concrete mixers demand rugged power. Most work, for example, is off the road and the mixer engine is subjected to severe jolting and sudden load shifts. The engine is also forced to operate in an atmosphere of abrasive cement dust. The engine is required to turn drum loads ranging up to 40,000 lbs. Operating speeds fluctuate suddenly from 2400 rpm during loading to 800 rpm during agitation.

T. L. Smith Co. has found that Chrysler Industrial Engines are engineered and built to meet these rugged demands better than any other engine in the field. Chrysler's fluid coupling, for example, absorbs sudden load shocks, prolongs engine life. Chrysler's efficient oil-bath air cleaner keeps harmful cement dust from fouling the engine. Chrysler Engines have also proved able to operate at continuous low speeds under heavy loads for long periods without excessive carbon build-up. Most important, Chrysler's day-in, day-out dependability means minimum down time for T. L. Smith customers. In fact, many Chrysler-powered units which are still on the job after six and seven years have never had a major maintenance problem.

Chrysler
INDUSTRIAL ENGINES

INDUSTRIAL ENGINE DIVISION • CHRYSLER CORPORATION

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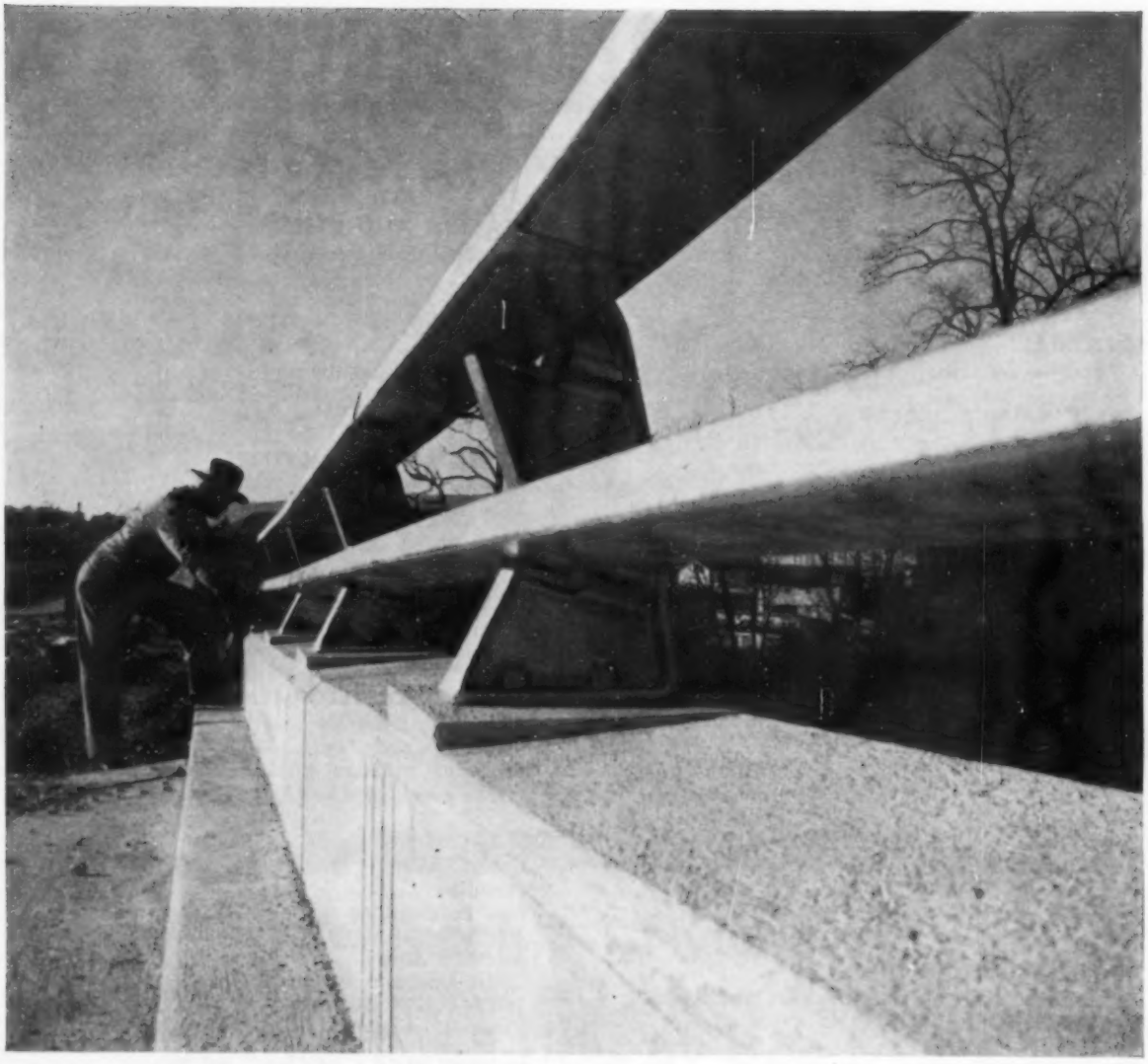

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Handsome, Sturdy, Easy to Install

Bethlehem's new Perfect Vision bridge rail is attractive, sturdy and easy to install. Steel box channels and malleable iron posts arrive at the bridge site ready for quick installation. There's no welding or riveting necessary; after placing posts in position, only a few nuts must be tightened.

The new rail is made in four styles: one- or two-rail models for mounting on a parapet, and three- or four-rail designs for a curb or sidewalk.

Rails are furnished in any length from 7 to 20 ft. They are 2 x 5 in. box channels cold-formed from ⅛-in. steel and galvanized in accordance with ASTM specification A-123. The galvanized posts are spaced on 9 ft 6 in. centers and connected to the parapet by four 1⅛ in. anchor bolts set in the concrete. The railing exceeds the requirements of the 1953 AASHO Specifications for railing loading. And when rails are damaged, they're easily replaced.

Get full details on this sturdy, handsome bridge rail, with "see-through" design. Just phone or write the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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ROADS AND STREETS

A GILLETTE PUBLICATION • AUGUST, 1958 • VOLUME 101 • NUMBER 8

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Ohio job paved with 8-yard central mixer and concrete dump bodies. . . . How to figure your equipment depreciation. . . . Million-yard sandstone cut worked with scrapers. . . . Alaska's vast future highway needs. . . . Asphaltic concrete bases for heavy traffic—how used in German road program. . . . Watch for new series on how some states are doubling or tripling their road job awards this year.

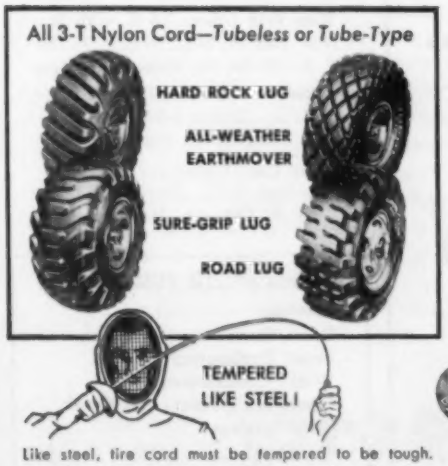
Look for this nearby Goodyear dealer sign for better tire values —better tire care.

COUNTLESS TONS. Its $400,000,000 price tag attests the scope of this job—which runs nearly 1/5 the way around the world! Up to their ears in countless tons of muck, muskeg, rock, shale and dirt, the contractors are coming up with a minimum of 22-foot pavement on 5- to 10-foot shoulders—and only 271 miles of "impassable" gaps still to go! Shown here is an all-mountain sector in British Columbia which previously boasted *no roads at all.* From coast to coast, Trans-Canada's hard-won miles have felt the sure imprint of Goodyear 3-T Nylon Cord off-the-road tires.

Triple-Tough 3-T Nylon Cord—

*the **extra** durability **exclusive** with*

Off-The-Road Tires by Goodyear!



Like steel, tire cord must be *tempered* to be tough. Goodyear's exclusive process, involves *Tension, Temperature and Time, triple-tempers* cord to make it TRIPLE-TOUGH—for longest tire life, lowest cost-per-yard.

From treads to beads, Goodyear off-the-road tires bring you the most advanced and experienced design, engineering and construction known today.

High among Goodyear's exclusive advancements is TRIPLE-TOUGH 3-T NYLON CORD—called the greatest tire *saver* in 23 years.

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And on-the-job savings have been spectacular—on some of the toughest jobs on earth!

Try TRIPLE-TOUGH 3-T NYLONS on *your* toughest jobs. You'll agree that "Goodyear is There"—in every way! Goodyear, Truck Tire Dept., Akron 16, Ohio.

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Buy and Specify

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MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

All-Weather, Road Lug, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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ON ASPHALT—These pictures show the Barco Vibra-Tamp working on asphalt surfacing at an Arizona motel. It moves along, self-propelled, at a uniform rate with minimum effort required of operator.

built to handle MORE JOBS!

VIBRA TAMP

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Here's why users like the Barco VIBRA-TAMP:

MANY USES! The handiest small machine you ever used for tamping, compacting, and smoothing sand, gravel, soil, cinders, chips, cement and soil mixtures, and asphalt surfacing. Use it in restricted areas, close to walls, around posts, in trenches, for patch jobs and clean-up jobs, leveling of areas around footings, smoothing sub-base fill for slab floors, inside foundations and countless other places!

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ECONOMICAL—Low initial cost; low operating cost. Easy to move anywhere. No special tools required. Saves your bigger, costlier equipment. ORDER YOUR VIBRA-TAMP NOW. *Catalog No. 630 on request.*

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NEW SUPER GG* Road Builder Tire Cuts Costs, Speeds Work on Tough, Precise Jobs!

Firestone's new Super Ground Grip Road Builder tire helps beat schedules on the most exacting grader jobs! There are two big reasons why—new Firestone Rubber-X, and Firestone S/F (Shock-Fortified) Nylon cord! Exclusive Firestone Rubber-X is *the longest wearing material ever used in tires.* The new curved bar tread design gives maximum traction on any terrain, eliminates vibration and bounce on light cuts at speeds below one mile per hour. Firestone S/F (Shock-Fortified) Nylon armors the tire body against the worst punishment rugged road beds can deliver, adds extra miles of service under all operating conditions. Reinforced sidewall resists damage from scuffing. It's the strongest, longest wearing road grader tire you can own! Ask your Firestone Tire Expert about these heavy-duty favorites. See him at your local Firestone Dealer or Store.

Firestone

BETTER RUBBER FROM START TO FINISH

*SUPER GROUND GRIP® ROAD BUILDER

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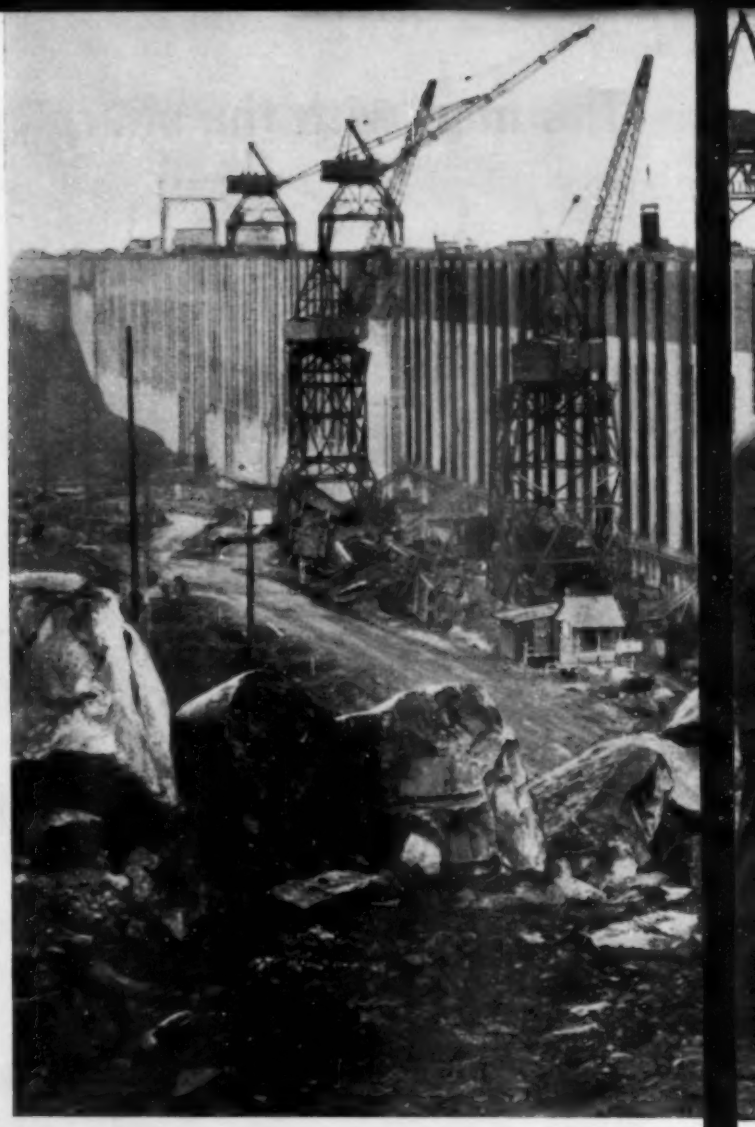

AN ESTIMATED 73% of the petroleum requirements on major St. Lawrence Seaway projects have been supplied by Texaco. Picture shows Bill Partisch (left), Texaco Lubrication Engineer, and Vic Pandolfi, Equipment Superintendent, discussing the Texaco Lube Plan, represented by the numbered barrels. In background, upstream side of Barnhart Island Power Dam and Robert E. Saunders Generating Station designed to generate 1,880,000 kilowatts. Construction of the 3,230-ft. wide, 167-ft. high concrete gravity dam involved excavation of more than 2,500,000 cu. yds. of earth and placing of approximately 2,000,000 cu. yds. of concrete. Dam is a joint project of the Power Authority of the State of New York and the Hydro-Electric Commission of Ontario. Contractors for both U. S. and Canadian sides used Texaco lubricants and fuels, the Canadian contractors being supplied through McColl-Frontenac Oil Co., Ltd., Montreal, a Texaco subsidiary.

NO MORE THAN SIX SERVE ON

Texaco Plan reduces needed lubes to no more than six

MASSENA, N. Y.—Barnhart Island Power Dam is the world's second largest hydro electric project (first: Grand Coulee).

A Texaco lubrication plan and the service that makes it work are credited by the contractor's Equipment Superintendent with playing a significant role in keeping the contractors' equipment in an operating condition.

"The Texaco Lube Plan has really helped," says Victor Pandolfi, Equipment Superintendent for Perini, Walsh, Morrison, Kiewit, Utah Companies, General Contractors. "We've used no more than six high quality lubricants *for the entire project* instead of 15 or 20. There's been less inventory. It's been simpler to service and protect the equipment. We've avoided mistakes in lubrication, and saved manhours and money."

Most Contractors Use Plan

The Barnhart Island Power Dam is just one of the St. Lawrence Seaway projects on which the Texaco Simplified Lubrication Plan has been used. It's estimated that 73% of the petroleum requirements for the Seaway have been supplied by Texaco, and that most maintenance programs have included the Lube Plan.

The Plan has been endorsed for the following reasons: proper lubricants are recommended; less storage needed, reduced confusion and misapplication; lower handling and maintenance costs; less time lost by equipment; fewer lubricating errors; time and money saved.

Developed on the Job, For the Job

The Texaco Simplified Lubrication Plan was developed

THE ST. LAWRENCE POWER DAM

from on-the-job experience in all types of construction work. It's tailor-made for the work to be done. Lubricants may vary from job to job because each Plan is set up to meet the specific needs of a specific project. But regardless of the job, the basic fact remains that—*no more than six lubricants are needed to handle all major lubrication.*

Here are the six lubricants, illustrated above, used on the Barnhart Island project:
(1) For engines: *Texaco Ursa Oil Super Duty Special;* **(2)** for chassis, wheel bearing and general grease lubrication: *Texaco Marfak Multi-Purpose 2;* **(3)** for hydraulic units: *Texaco Regal Oil R&O;* **(4)** for transmissions and differentials: *Texaco Universal Gear Lubricant EP;* **(5)** for wire rope and open gears: *Texaco Crater;* **(6)** for enclosed reduction gears: *Texaco Gear Lube HD.*

Let a Texaco Lubrication Engineer work out a Simplified Lubrication Plan for your project. You'll save time, money and mistakes. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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$10,000

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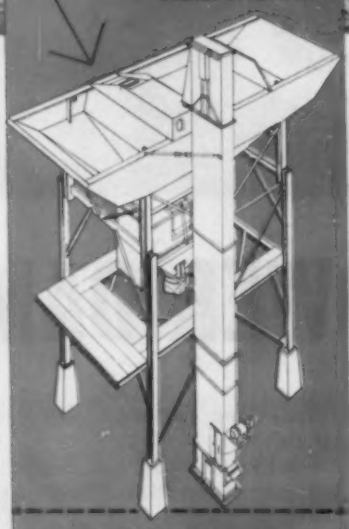

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J804 RS

At a minimum investment you can now get a high-quality transit-mix plant that meets strict specifications on paving, structural concrete jobs, or on commercial ready-mix operations. This low-cost Johnson Econoplant has all-welded 55-cubic yard bin with 3 aggregate compartments (tot. 45 cu. yds.) and a 70-bbl. cement compartment, complete with low-pressure aeration system. 180-bbl.-an-hour cement bucket elevator has 3 h.p. gearmotor with roller-chain drive, and boot hopper for bulk or bag cement.

Meets rigid specifications

One of the big *plus* values of this Econoplant is *separate weighing of cement* to comply with exacting requirements for specification concrete. Included in the low price is Johnson's 3 cubic yard Concentric aggregate-cement batcher, manually-operated. It weighs the cement on an *independent* scale, separate from aggregates. Centrally-located, sealed hopper discharges cement *within* the aggregates. This minimizes dusting, and pre-mixes all materials.

Econoplant is ideal for clamshell charging — has large aggregate bin openings. Charging height is only 30½ feet. Where desired, it can be equipped with belt conveyor, open-inclined or vertical-enclosed bucket elevator for aggregates, at additional cost — also auxiliary storage silo, and undertrack screw conveyor system for cement.

Other optional accessories: bin signals, water meter — and weather-proof electric control panel for all plant motors (a package unit, requiring only simple field wiring). See your local Johnson distributor — or mail the coupon *today*.

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Not much wider than a yardstick . . .

Here's a companion-model utility trencher, mounted on rubber tires — the Parsons 88 Trenchmobile®. It makes self-powered moves over city streets, highways, through traffic at travel speeds up to 12.6 m.p.h. — maintains fast "work-and-run" schedules. Trenchmobile digs 8 or 16 inches wide, at depths to 5 feet. Ladder and wheel-type Trenchliners are available for digging up to 6 feet wide, 19 feet deep.

Parsons introduces a NEW small 77 Trenchliner...

. . . It's only 3 feet-8 inches wide. Working height, with boom in digging position, is just 5 feet-8 inches. What's more, this little Parsons 77 Trenchliner only weighs about 6500 pounds for convenient trailer-transport from job to job. Small in size, but big in capacity, the 77 has a work range that will surprise you. For instance . . .

Digs up to 5 feet deep

It produces from 4.4 inches to 21 lineal feet of trench per minute, in 32 hi-lo digging speed selections. You get trench widths from 6 to 18 inches, *and maximum digging depth of 5 feet!* The tiny 77 is heavy-duty in every respect. It has positive down-crowd on telescopic ladder boom. Self cleaning, cast-steel buckets are equipped with Parsons "Tap-In" teeth. Shiftable spoil conveyor is instantly reversible for controlled discharge. Compact and maneuverable, the 77 turns within its own length — each crawler is independently driven, independently braked. Better check what this small utility 77 Trenchliner can do on service connections, small mains, underground cables, lighting systems, curb, foundation footings. Ask Parsons distributor for demonstration, or write to us today.

Mail today to: PARSONS COMPANY, Newton, Iowa

Send literature on: ☐ *77 Trenchliner* ☐ *88 Trenchmobile*

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TITLE .....

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STREET .....

CITY, STATE .....

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PARSONS® TRENCHLINER® *A division of Koehring Company*

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Without Redicote

Two asphalt-coated pebbles, magnified many times, show what Redicote can do. When these pebbles were subjected to a steady stream of water, the one above was stripped of asphalt. The one below was not. The reason? Asphalt on the pebble below contains Armour's new anti-stripping additive —Redicote.

With Redicote

REDICOTE®

makes asphalt stick —even to water soaked aggregate

Already tested and used in many states, Armour's economical asphalt additives are your best defense against stripping!

Many states have already tested and approved the Redicotes. They find that as little as 0.3% Redicote in an asphalt emulsion locks the asphalt onto *any aggregate*—even difficult-to-coat acidic, alkaline or locally available mixed gravel.

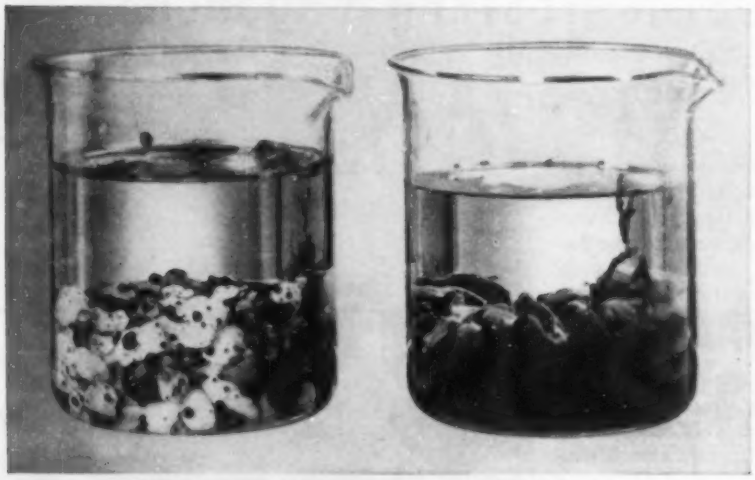
Every kind of weather is good asphalt—paving weather when you use Armour's Redicotes. They prevent stripping when used in road oil, cutback and emulsified asphalts or asphalt cements.

Redicote 75—100% active. Recommended for cold mix asphalt cutbacks where stability to extreme storage temperature is not required. Outstanding wetting-bonding agent under adverse weather conditions. Ideal for cutback asphalts and emulsions.

Redicote 2793—60% active. Economical and effective additive at 70°F. Right for most jobs where a free-flowing additive is required.

Redicote 2323—60% active. Developed to meet heat storage-stability requirements. Maintains effectiveness after 7 days at 450° F. Ideal for asphalt cements, where desired.

It is not necessary to modify the Redicotes. One of three basic formulas meets any asphalt requirement—hot or cold. Send for samples, and prove to yourself how Redicotes prevent stripping. Also ask for the new booklet describing the Redicotes.



Without Redicote *With Redicote*

Redicote 75 passes the Pennsylvania wet aggregate coating test

Only 0.4% Redicote 75 was added to RC-3 asphalt in beaker on right. No additive was used in the "control" asphalt on left. Pennsylvania aggregate was coated with the two mixtures under water. After static immersion, aggregate on the right coated with asphalt containing Redicote retained a 95% coating. Aggregate on the left held only 10% of its asphalt.

ARMOUR CHEMICAL DIVISION

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Leader in Progressive Fatty Acid Chemistry

RS-8-58

I want to learn more about Redicote Asphalt Additives!

Please send me: ☐ **The new Redicote booklet.**
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☐ Additional data for coating the following type aggregate:

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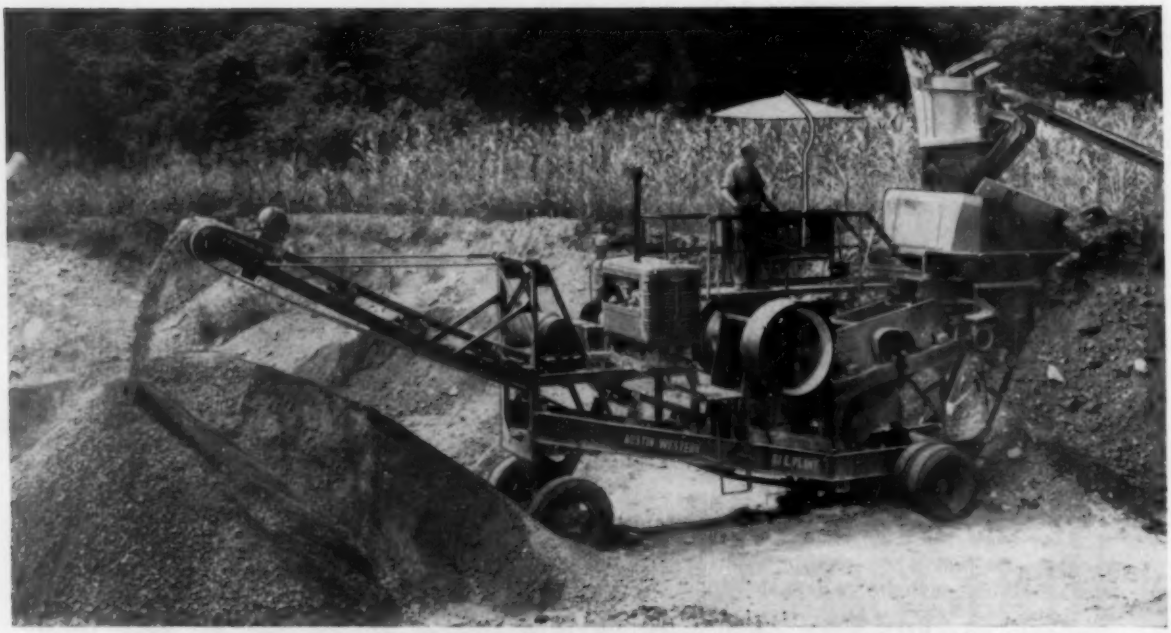

Lima Austin-Western 61-E portable diesel-electric plant equipped with 10" x 24" Roller Bearing Jaw Crusher and 2' x 6' double deck Gyrating Screen. A complete single-pass crushing and screening unit that can move in and out of a job in a minimum of time.

LIMA AUSTIN-WESTERN CRUSHERS

. . . for high output at low cost

There's a Lima Austin-Western crusher engineered for every job. In all cases, the components are accurately balanced to give high output with minimum maintenance. Apron or Reciprocating Feeders control the flow of material, eliminating overloads, choking and surging. Centralized power plants, anti-friction bearings, and fewer shafts, belts and gears keep operating costs low.

Portable plants are designed for fast moves and easy setups. Weight is distributed to meet most state highway limitations. One-man operation reduces the cost per ton. Their wide range of adjustment makes it simple to meet rigid specifications.

The Lima Austin-Western line includes jaw and roll crushers in many sizes, plus matching screens, elevators, conveyors and bins. Call on your nearest distributor for full information. Or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

Lima Austin-Western stationary crushing plant producing washed sand and three sizes of specification material.

Lima Austin-Western 101-S closed circuit portable crushing and screening plant: a high-output unit delivering sand and roadbase material in two sizes.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

LIMA AUSTIN-WESTERN Crushing, Screening and Washing Equipment

BALDWIN · LIMA · HAMILTON

CONSTRUCTION EQUIPMENT DIVISION • LIMA, OHIO 581

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Move up to King-size profits

K370 1¾-yard shovel-crane delivers 16% or more output than 1½-yard rigs

There's good reason volume producers move up from 1½ yeard shovels and draglines to Link-Belt Speeder 1¾ yard machines and write new production records. Here's why:

1. 16% more bucket capacity offsets the slight added cost of "buying up" to the 1¾ yard K-370.

2. Fast—maneuverable as many smaller machines because of Speed-o-Matic power hydraulic controls and hydraulic power steer.

3. Produces as much as many 2-yard rigs because of the power hydraulic controls and bonus usable horsepower.

Move up to a 1¾ yard K-370 . . . cut your per yard cost . . . improve your competitive position . . . put yourself in line for King-size profits.

For details on the K-370 and its 3-yard mate (K-608) see your distributor or write Link-Belt Speeder Corporation, Cedar Rapids, Iowa. 14.800

LINK-BELT SPEEDER

It's time to compare . . . with a Link-Belt Speeder

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How the Planet Powered
ups rock-dozing capacity both

You don't have to jockey around, or settle for "shirt-tail" loads, or get only part-capacity performance, when you concentrate the International TD-24's full rock-slamming power—right where you want it!

You don't waste time, and fuel, and tractor life with rear-end "sluing." You don't have to "paw dirt" and then wind-up "nibbling," instead of blading out full bites. You don't lose momentum and let the blade lose part of the load every time you steer. Not with TD-24 "follow-through"!

Exclusive International Planet Power steering makes the big difference.

"Dead-track drag" is eliminated

You don't "half-kill" your power and traction to guide the TD-24, as you must with any king-size steering clutch tractor. Instead, Planet Power steering gives you full-time "live" power on both tracks while turning—or while "equalizing" to steer accurately with offset loads. And the TD-24 handles the same big loads on turns or straightaways!

Besides, the TD-24 gives you cycle-speeding, on-the-go Hi-Lo shifting. You adjust speed to the load without stopping, going forward or in reverse. You speed up the shuttle-dozing cycle, take full-time advantage of the TD-24's full capacity!

The fingers of one hand control these TD-24 performance exclusives!

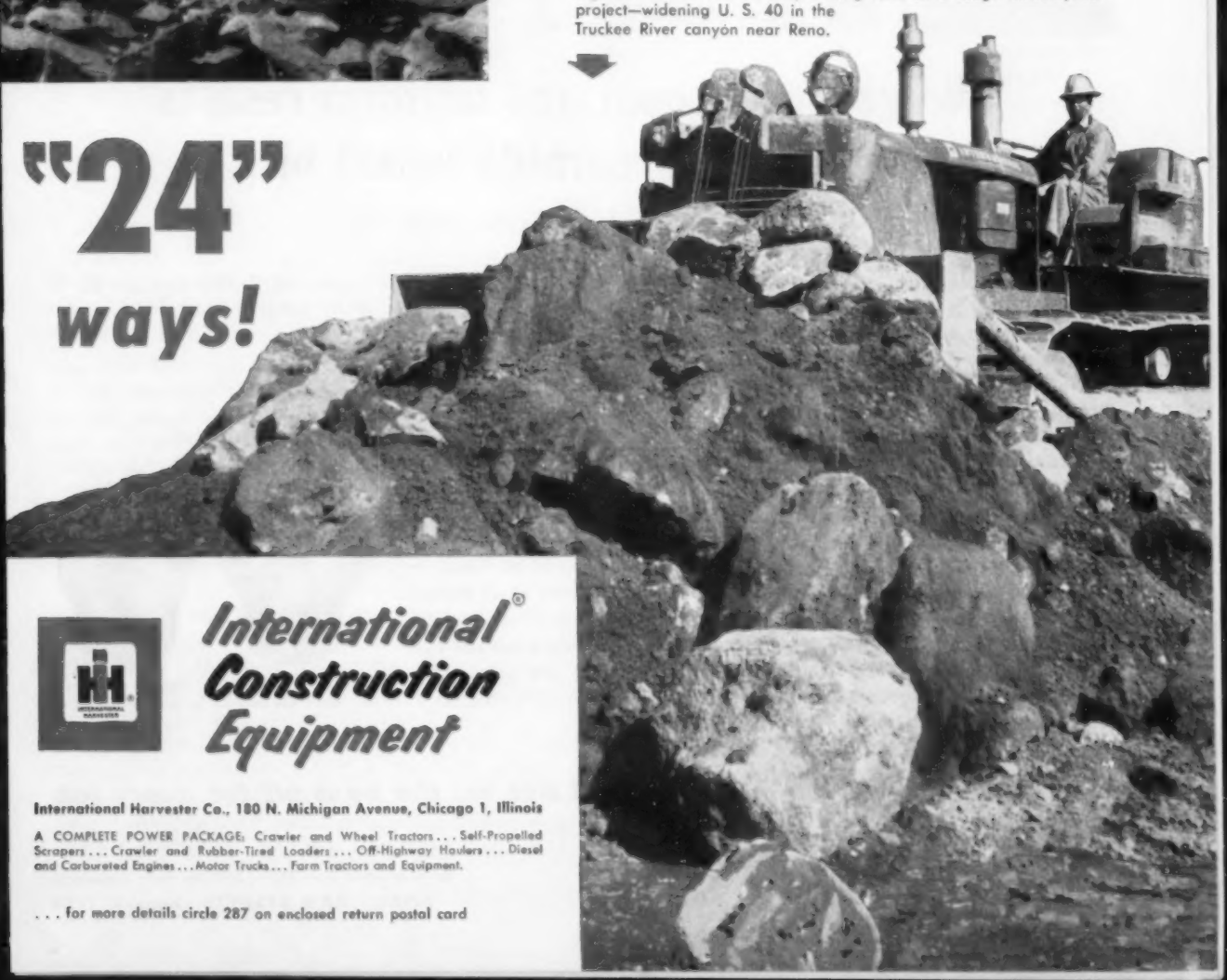
Watch a TD-24 perform—see why rock-movers call it the "rock-dozing special." Visualize how this load-control and bonus capacity make the TD-24 the ideal pusher, or outstanding for non-stop, big scraper pulling! See your International Construction Equipment Distributor for a demonstration.

Put one track in high range, the other in low—and the TD-24 pushes straight ahead, despite the tremendous offset load of benching-out unshot rock strata. P. C. Cooper, Blountsville, Tennessee, first rented this TD-24—then bought it because of its rock-'dozing performance!

An 8-unit TD-24 fleet owned by Rusciano and Sons Corp., replaced 8 big competitive crawlers—because TD-24 performance "measured up" to the toughness of this big road job. There was a considerable tonnage of granite and other rock to bulldoze—on the White Plains (N.Y.) Section of the 'Cross Westchester Expressway!

"With the TD-24, I can outwork any other machine where you have to push and turn with a big load," declares Operator Dan Olmstead, for Gibbons & Reed, Salt Lake City, Utah. "The TD-24 keeps the load moving, because you don't lose power braking a track." The TD-24 is spreading rock on a tough million-yard project—widening U. S. 40 in the Truckee River canyon near Reno.

"24" ways!

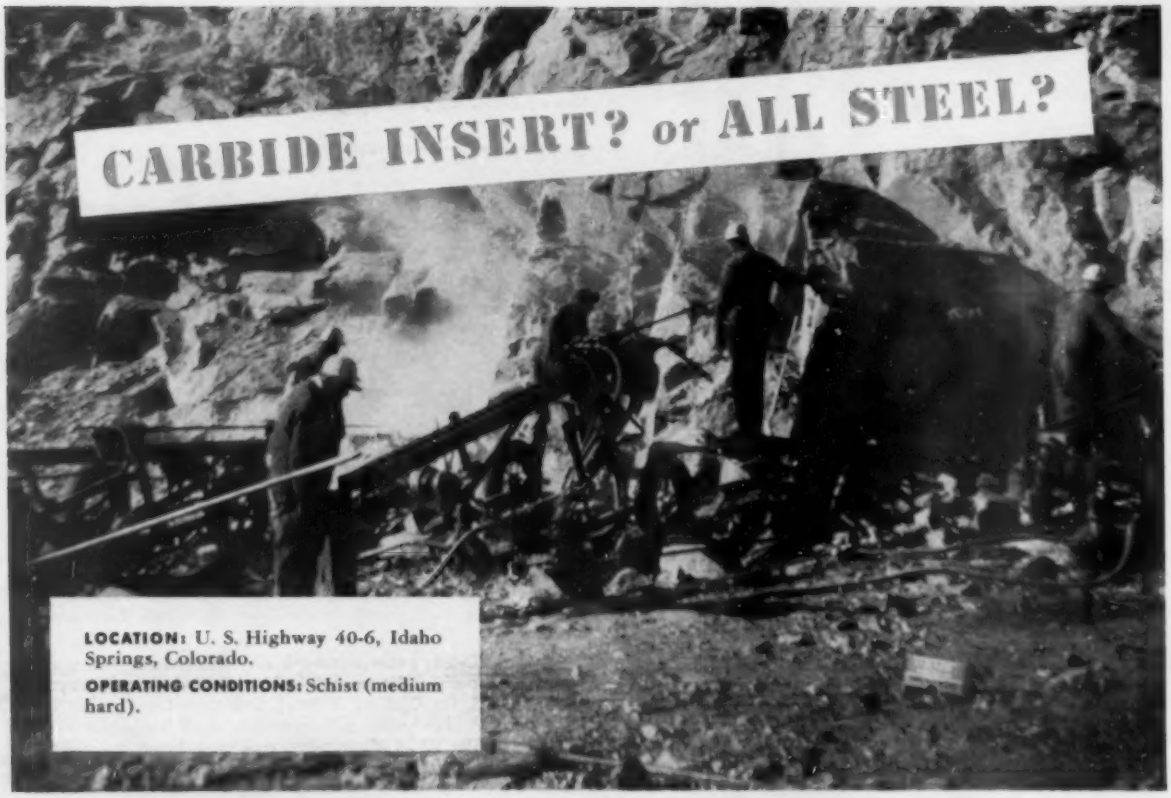


International® Construction Equipment

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

. . . for more details circle 287 on enclosed return postal card



"We get lower cost and uniform results with TIMKEN® carbide insert bits"

. . . Reports Z. H. Lowdermilk, Inc.

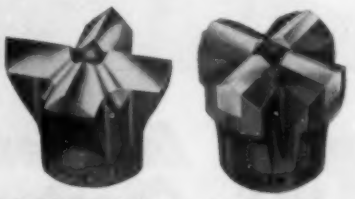
THE first Colorado link in the Transcontinental Superhighway—four lanes on U. S. 40-6 near Idaho Springs, Colo., — required drilling through schist. Z. H. Lowdermilk, Inc., report they get lower bit cost per foot-of-hole and consistent footage drilled with Timken® carbide insert bits.

On jobs like this, you can get maximum economies and best results using Timken carbide insert bits. But carbide insert bits are not always best in every case. In ordinary ground, Timken all steel multi-use bits save you the most. With correct and controlled reconditioning, they give you lowest bit cost per foot-of-hole when you can drill full increments of steel.

Whichever type you use, your drillers will save time. Timken carbide insert and all steel multi-use bits are interchangeable in the same thread series. Drillers can change bits right on the job without changing drill steels.

Both bits are made of Timken electric furnace fine alloy steel. We're the only American removable bit manufacturer that takes the extra quality control step of making its own steel. For further protection, Timken bits have a specially developed shoulder union that guards threads against drilling impacts.

To get the right and most economical bit for your job, call or write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO".



Timken threaded all steel multi-use rock bit

Timken threaded carbide insert rock bit

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit for every job

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ROADS AND STREETS
Sixty-Six Years of Editorial Leadership

Washington News Letter

Exclusive - By Duane L. Cronk, Director, Highway Information Services

August 10, 1958

A leading highway consultant in a Washington speech last month opened a closet door and let the light of day fall full on a family skeleton that has on more than one occasion embarrassed the highway fraternity. To wit: The persistent efforts of state highway departments to build up their internal engineering forces in spite of the ability and availability of private consultants to accomplish much of the engineering job.

The speaker, Highway Consultant John Clarkeson, of Boston, took issue with this trend. He predicted that within a few years more than 80 percent of the engineers in this country would be on public payrolls, rather than exercising their talents in the fuller degree possible under private enterprise. Another result, he implied, will be that more and more of the highway dollar will be lost in engineering rather than for new highways. Contractors, he told Roads and Streets are proud of their own victory in establishing construction as a private enterprise function but they have failed to see that bureaucratic engineering is somewhat comparable to force account and entails the same higher costs and inefficiencies.

"Still I hear no voice raised about it or public discussion of it."

* * *

The time has come, he declared, "to appraise this matter completely on its merits to stop the gossip mongering and the tongue-in-cheek attitudes." He specifically called for action by the American Road Builders Association, the Associated General Contractors of America and the U.S. Chamber of Commerce, all organizations which normally deplore the expansion of bureaucratic services in competition with private enterprise.

He cited the recommendations of the Hoover Commission which found that in a gross expenditure of $8 billion for construction, engineering accomplished by the various government agencies involved ran from 5.2 percent to 17.8 percent. The Commission concluded:

"By contracting to private architect-engineer and construction organizations all phases of design and construction work on Government construction projects, relatively small supervisory engineering organizations in the executive agencies could furnish the preliminary study, preplanning and budgeting, and the supervisory management and control essential for all Government projects, without maintaining through periods of fluctuating demands the present costly overhead for complete engineering and construction staffs. With minor exceptions, the AEC (Atomic Energy Commission) has been operating under such a program. If other Federal agencies could attain the operating efficiency of the AEC, the savings to the Government in just the cost of design and supervision of construction, on the basis of present volume of business, would be more than $100 million annually." (Out of a total of $900 million for engineering).

(continued on next page)

The average engineering cost for highway work was 16 percent of the cost of construction during his career in a highway department, Mr. Clarkeson said. "I know of no firm being paid this amount on the present road program."

Engineering by private firms has been the accepted philosophy of numerous other federal agencies, he noted. Almost all public buildings are privately designed. All of the work of the AEC and State Department, much of the work of the Corps of Engineers, the Civil Engineer Corps of the Navy. He charged that federal highway officials, although recognizing the use of private firms "when necessary," continue to sabotage this segment of private enterprise in its daily dealings with the states by stressing the undesirability of private engineering groups.

This attitude in the highway field is particularly inconsistent, Mr. Clarkeson believes, since private enterprise engineering has demonstrated its capacity by locating and designing most of the nation's toll roads and by getting the National Interstate System program under way in state after state which were bogged down by staff shortages. Even until very recently, he said, up to 83 percent of the contract drawings produced in some states were by consultants.

Consultants have done an excellent job, he declared, not only in helping highway administrators to get this immense production job under way but in serving as objective "third parties" where projects have bogged down in argument between the department and citizen protest groups. Top officials who are now speaking loosely of casting aside consultants to assume all their own engineering would do well to think it through again.

* * *

Not nearly so incendiary as Mr. Clarkeson's "call to arms" but of interest to the industry were other Washington developments. One of these was a two-day round of hearings on the Federal Airport Act. Congressmen have introduced a number of bills, the most popular of which, apparently, is a proposal to boost federal aid for this kind of construction from the current $63 million annually to $100 million and throw in another $75 million this year alone as an "anti-recession" move.

Contractor organizations rallied to the cause, along with numerous other associations, to appeal for passage of the bills. The American Road Builders Association pointed out that few if any existing airports are capable of meeting the demands of tomorrow's traffic without extensive improvements and that the costs of reconstruction are above the ability of local governments to meet them. Max C. Harrison, Pittsburgh contractor, spoke for the Associated General Contractors in his recommendations for "a continuing airport improvement program."

* * *

Airport construction under the federal-aid program has had its ups and downs. The Administration is still opposed to the proposals, would like to see this function turned back to the states and cities. Most local officials, however, see an active role for Uncle Sam in financing such construction. A. B. McMullen, executive director of the National Association of State Aviation Officials, pointed out that a recent survey of needs revealed that more than $1 billion worth of work should be undertaken within the next few years and that local and state agencies expect to be able to provide only $590 million.

Seal coating of flexible airport pavements and filling of joints in rigid pavements (at small airports only) would be made eligible for federal-aid under the proposed bill. Heretofore, the local agencies have had to bear this expense themselves. Most of the witnesses testifying on the measure urged that this provision be preserved in the bill despite its departure from current federal policy.

B.F.Goodrich

B.F.Goodrich tires give up to 50% more service, contractor reports

F. R. HEWETT CO., general contractor of Spokane, Washington, operates 147 pieces of equipment on jobs throughout the Pacific Northwest. Here the job is the Spokane Valley Freeway. "We switched to B.F.Goodrich FLEX-RITE NYLON Rock Logger tires 3 years ago," writes Truck Supt. Richard M. Ward. "They have given us up to 50% more service than the tires we used previously—and we have been able to retread them too!" Today Hewett uses B.F.Goodrich tires 100%.

Reports like this come in from contractors all over the country. They find B.F.Goodrich off-the-road tires give them longer, trouble-free service, thanks in part to FLEX-RITE NYLON cord construction. FLEX-RITE NYLON withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. Result: the FLEX-RITE NYLON cord body outwears even extra-thick B.F.Goodrich treads —can be retreaded over and over.

Follow the lead of contractors like Hewett, who reports B.F.Goodrich tires give "very low cost per hour." See your B.F.Goodrich dealer today. He's listed under Tires in the Yellow Pages of your phone book. And ask about the new Rock Service Tubeless or conventional tire that prevents unnecessary tire failures! *B.F.Goodrich Tire Co., A Division of The B.F.Goodrich Co., Akron 18, Ohio.*

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

B.F.Goodrich *truck tires*

© The B.F.Goodrich Company

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This easy handling Travel-Crew Cab model carries six men in all-weather comfort to the job site. It's rated up to 25,500 lbs. GVW. Plenty of leg room fore and aft. Seats measure over five feet wide. Third door means easier access to rear. Cab and chassis are warranted *work-ready . . .* for one, low *complete unit* price. Six-cylinder engine economy in compact-design or conventional models. Tandem-axle models to 33,000 lbs. GVW.

Bonus loadspace pickup bodies up to 8½ feet long "hotshot" all-purpose loads. Floor and side-walls of all-steel construction add unit tightness and longer life. Three men ride in comfort—seat is over five feet wide. More forward vision with the biggest distortion-free windshield in its class. Add to this an economical "six," more usable horsepower, high torque at low rpm.—and, component for component, you'll get a better buy!

INTERNATIONAL TRUCKS

Money-saving ways to move machines...materials...men!

Rugged INTERNATIONAL V-8 trucks
engineered by truck specialists for extra-heavy-duty work.

INTERNATIONAL Travel-Crew Cab trucks
that haul six-man crews and full-sized loads.

Bonus-load INTERNATIONAL pickup trucks
that give you more "go" with traditional six-cylinder engine economy.

INTERNATIONAL **V-8 trucks** continue to bring you the newest in heavy-duty power and economy! Engines are specially matched to drive lines to pull *your* load on *your* operation at lowest cost. Metered-flow engine water jacket design evens engine temperatures. All-truck pistons and rings reduce oil consumption. Finish-honed replaceable exhaust valve guides and self-aligning tappets mean reduced down-time. The result? A dependable truck that gets the job done on schedule at *least* cost. Ratings to 65,000 lbs. GCW. See your INTERNATIONAL Truck Dealer for more information.

INTERNATIONAL HARVESTER COMPANY, CHICAGO
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

cost least to own!

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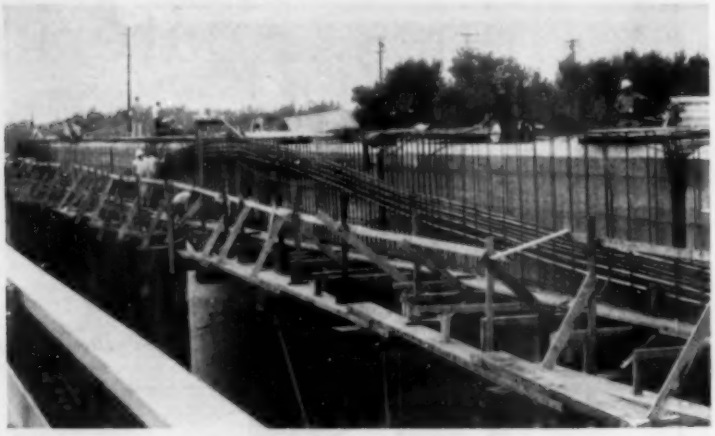
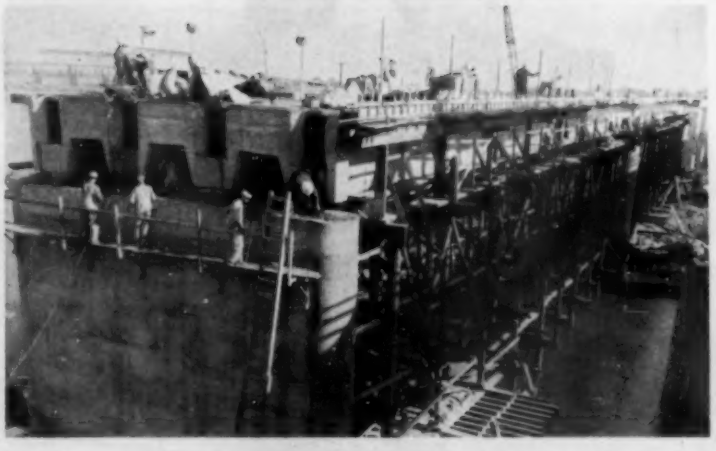
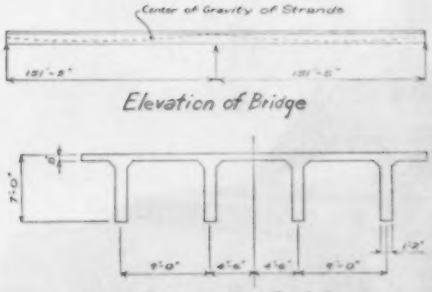
PRESTRESSED CONCRETE BRIDGE across Feather River at Marysville, California • Designed by Ben C. Gerwick Inc. with William J. Talbot Jr. as Chief Engineer • Consultants on prestressed concrete continuous spans—T. Y. Lin & Associates • E. E. Watkins, Road Commissioner of Sutter County, Cal. was responsible for the project, with Charles W. Deterding in charge. Contractor—Pacific Bridge Co.



Roebling strands encased in flexible metal hose being placed in form. Path of strands is at highest point over center pier.

End view after completion of jacking.





Elevation of Bridge

Cross-Section at ℄ Each Span

How to build a long-span vehicular bridge at an initial saving of $12,299

Here is an excellent example of a continuous prestressed concrete bridge, with two 151-ft. spans across the Feather River at Marysville, California. It effects savings—both initial and in operational maintenance—that can only be considered impressive.

As measured by bids, both steel and prestressed, the initial savings were $12,299. Projected maintenance savings as well as insurance savings will accrue over the years to add to this already attractive cost picture.

T. Y. Lin, consultant on continuous prestressed concrete spans, stated in an Engineering News Record article:—

"General opinion is that cost of long-span continuous prestressed concrete bridges might not be as economical as conventional designs using structural steel. But the bidding and the successful completion of this bridge across the Feather River at Marysville, Calif., indicated that this type of prestressed concrete bridge can be competitive.

"A total of only thirty-two 1 11/16 in. strands (each 300 ft. long) was employed for prestressing the two continuous spans. These cables, supplied by John A. Roebling's Sons Corp., were easily laid, tensioned and grouted. Simple T sections, instead of modified T or box sections, were adopted for the bridge, thus minimizing the cost of formwork and facilitating the placing of concrete.

"In addition to the two main spans, the two-lane bridge has 23 spans of 80 ft. precast, prestressed concrete T-beams. Roadway width for the two-lane structure is 28 ft. and sidewalks increase the width between railings to 35 ft. 5 in.

"The four cast-in-place T-girders for the continuous spans are spaced 9 ft. c-c and are 7 ft. deep. The 8 in. thick deck forms the flange of the T section."

The savings wherever prestressed is employed speak for themselves. We invite you to get in touch with us on anything that has to do with this really remarkable building method. Since prestressed's introduction into this country, we at Roebling have pursued and championed it as a construction mode with the results shown here... and the Feather River Bridge is but one of many, many similar examples. Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities — Subsidiary of The Colorado Fuel and Iron Corporation

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COVER SCENE

Showing drilling for blasting a 700,000-cubic-yard rock cliff, on relocation on U. S. 85 near Santa Fe, New Mexico. Contractor: Metropolitan Paving Co., Oklahoma City. Equipment: a Gardner-Denver D99-D drill with Gardner-Denver 600 cfs compressor mounted on a Caterpillar D8 tractor.

Highway Engineers Needed

The Bureau of Public Roads needs experienced highway and bridge engineers for filling positions paying from $5,335 to $8,645 a year at various locations. Most vacancies are in positions paying starting salaries of $7,465 a year. Some, paying $8,645, will also be filled at locations outside the U.S. for work on inter-American highways.

To qualify, applicants must have had appropriate education and/or experience including at least one year of specialized highway or bridge engineering work. Further information about the requirements and how to apply is given in civil service Announcement No. 112 B. Announcements and application forms may be obtained from most post offices throughout the country or from the U.S. Civil Service Commission, Washington 25, D. C.

Applications for these positions will be accepted until further notice by the Board of U.S. Civil Service Examiners, Bureau of Public Roads, Department of Commerce, Washington 25, D. C.

Trucks vs. Road Design

An Ohio investigation reports that 50-70 percent of highway costs are due to passenger cars, 10-30 percent to multi-unit trucks and 8-20 percent to single-unit trucks.

This conclusion comes out of a two-year research made by the Engineering Experiment Station at Ohio State University, Columbus. The report is published as Bulletin 168, "Highway Costs and their Relationship to Vehicle Size," by Robert F. Baker, Robert Chieruzzi, and Richard W. Bletzacker.

The investigation was sponsored by the Ohio Trucking Association. It also resulted in the conclusion that revenues produced by taxes presently assessed against Ohio's multi-unit trucks are in line with their cost responsibility. The authors emphasized that 1953 conditions were used in the study.

ASCE Schedules Conference on Electronic Computation

A two-day conference on Electronic Computation, sponsored jointly by the Kansas City Section of the American Society of Civil Engineers and the Structural Division of ASCE, will be held in Kansas City, November 20-21, 1958.

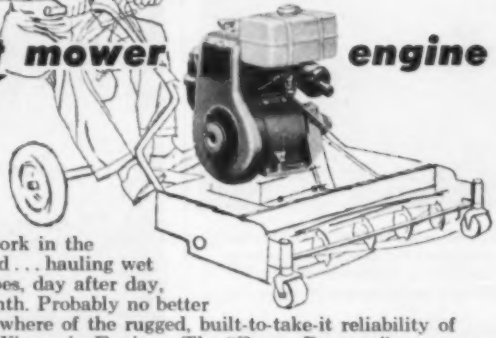
Four half-day sessions are planned to interest engineers just getting started as well as advanced users of electronic computers. Qualified workers have been invited to submit papers.

Secretary of the sponsoring Committee is Steven J. Fenves, Civil Engineering Hall, University of Illinois, Urbana, Ill.

● A safety record is claimed by the Ohio Turnpike Commission, which reports that during the month of May, 1958, 937,000 vehicles used the 240-mile highway without a fatal accident, and with but 42 reported traffic mishaps. This included a no-fatality Memorial Day week-end.

How power performance on construction jobs...

...can help you select the right mower engine



Rough, tough work in the construction field... hauling wet concrete up slopes, day after day, month after month. Probably no better proof exists anywhere of the rugged, built-to-take-it reliability of single-cylinder Wisconsin Engines. The "Power Barrows" you see here are powered by the same style of engine powering so many of the heavy-duty mowers and tillers.

Users know that Wisconsin-Powered mowers often sell for a few dollars more... BUT this is only the *first cost*. The true test of a mower is the reliability and *economy on the job*. That's why mower buyers who hire men to do mowing, day after day, month after month endorse Wisconsin-powered equipment... where manhours represent dollars. When the equipment is Wisconsin-powered, servicing is at a minimum and *the manhours you pay for* become work hours.

Write for bulletin S-223, today, describing all Wisconsin Engines.

2,000 service stations... several near you!

WISCONSIN ENGINE POWER

first choice of professionals.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

A8-6181

... for more details circle 323 on enclosed return postal card

They cut a flood control job

with Allis-Chalmers construction machinery

Don Cunningham Construction Co.—with a crack crew and fleet of Allis-Chalmers construction machines—have set an outstanding record on a New Mexico soil conservation job. They completed a flood control project scheduled for 180 days in 75. It involved 325,000 yd of earth fill.

Don Cunningham gives major credit to his Allis-Chalmers fleet—motor scrapers, crawler tractors and motor grader. He's convinced that top machine availability and extreme ease of handling are the big reasons why men and equipment were able to maintain the record pace. Cunningham estimates profit on this contract will be 20 percent greater than figured in the original bid—a hefty bonus on any job!

A SURE-FIRE SUCCESS FORMULA!

The Cunningham Construction Company is proud of its reputation for high-production earth moving. Says Don Cunningham: "The combination of Allis-Chalmers' productive machines and a first-rate operating crew, teamed with the excellent service our dealer provides, amounts to *an unbeatable formula for sure profits in this industry.*"

The equipment spread includes four Allis-Chalmers motor scrapers—two TS-360's and two TS-260's—plus five turbocharged HD-21 crawler tractors. Two of the tractors are used as pushers, one as a dozer. Another HD-21 tows a four-gang sheepsfoot roller and the fifth pulls an 18-yd scraper. An Allis-Chalmers FORTY FIVE motor grader levels fill, keeps haul routes smooth for high-speed scraper cycles.

Big 120-horsepower FORTY FIVE motor grader blades fill at dam site, keeps pace with fast-moving equipment like the 20-yard TS-360 motor scraper at right.

The flood control job consists of building two dams and diversion dikes, moving an estimated 325,000 cu yd in the Dona Ana area north of Las Cruces, New Mexico. Working a 54-hour week, the 10-man crew moved nearly 200,000 yd in the first 4½ weeks. This impressive volume brought construction people from all over Texas and New Mexico to see the spread in action.

Don Cunningham, veteran of more than 30 years in earth moving, points out that such performance is a powerful factor in bringing in more construction jobs.

Look ahead... *move ahead*...and stay ahead

6-month to 2½

Don Cunningham
El Paso, Texas

Four Allis-Chalmers motor scrapers, push-loaded by 225-horsepower turbo-charged, torque converter-equipped HD-21's, moved nearly a quarter of a million yards the first month, helped boost profits 20 percent for the whole job.

PREVENTIVE MAINTENANCE PAYS OFF AGAIN!

Chief mechanic, "Snuffy" Oliver, and his assistant have an effective preventive maintenance program, including daily inspection of tracks, fan belts, blowers, turbochargers, cables, clutches.

This regular maintenance keeps Cunningham's Allis-Chalmers fleet in first-class condition. Daily lubrication, servicing and inspection requires about 20 minutes a day for each machine. No other time was lost during the nine-hour working shift.

Compacting scraper-hauled fill, big HD-21 crawler tractor tows four-gang sheepsfoot roller.

The easy-service design of Allis-Chalmers crawler tractors, motor scrapers and motor graders speeds the preventive maintenance routine. For example, truck wheels, idlers and support rollers need lubrication only once every 1,000 operating hours. Time-saving convenience like this keeps every machine ready for action.

Whether your operations call for one unit or a fleet, you can get high production like this. Your Allis-Chalmers dealer will recommend the right equipment for your jobs—from a complete line of up-to-the-minute construction machinery. See him now and ask for a demonstration on your job. Allis-Chalmers, Construction Machinery Division, Milwaukee, Wisconsin.

with ALLIS-CHALMERS

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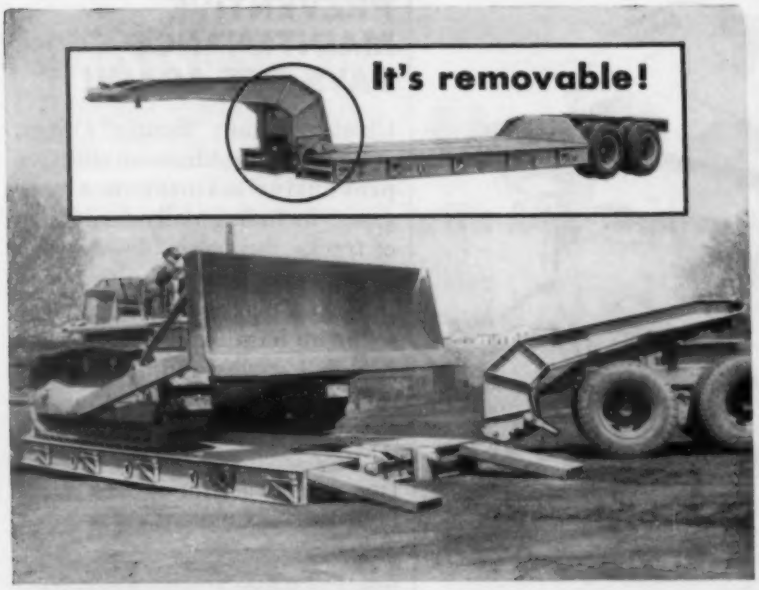


NEW-TYPE Low-Bed

Saves 2 to 3 hrs. on every move!

No cables!

•

No winch!

•

No hydraulics!

•

Gooseneck securely held at all times!

Here for the first time, is a *really practical* REMOVABLE GOOSENECK trailer, that can be loaded or unloaded over the *front end* in a few minutes — by ONE MAN. Time-tested fifth-wheel, king-pin connection between gooseneck and trailer simplifies alignment . . . eliminates need for complicated sheave and cable arrangements . . . and assures *complete control of gooseneck, whether hooked or unhooked from trailer.* Let us give you full information on this sensational LaCrosse development — *25 to 75-ton capacity* — with flat, drop-side or beam-deck, "tailored" to your needs. Beats anything else on the market. Call us now!

LC-44P

Mail for more facts

LaCROSSE TRAILER CORP., Dept. H115, LaCrosse, Wis.

Tell me more about LaCrosse Trailers (..... ton capacity)

☐ Std. Low-Bed ☐ Tilt-Type ☐ Removable Gooseneck

☐ Send name of nearest LaCrosse Trailer Distributor

Name ..... Title.....

Employed by .....

Address .....

City ..... State.....

Heavy metal fabrication since 1865

LaCROSSE

. . . the low-bed backed by a 1-year warranty

. . . for more details circle 294 on enclosed return postal card

Personals

K. B. Woods of Purdue Elected ASTM President

Kenneth B. Woods, head, School of Civil Engineering and Director, Joint Highway Research Project, Purdue University, has been elected president of the American Society for Testing Materials.

Elected vice president also at the recent ASTM convention at Boston was A. Allan Bates, vice president of research and development, Portland Cement Association. Frank L. LaQue, vice president, The International Nickel Co., Inc., continues as senior vice president.

ZACHARY SHERMAN, consulting engineer, has opened offices in Memphis, Tenn. at 3387 Poplar Avenue. The firm will specialize in the design of heavy structures, such as bridges, deep foundations, foundations for heavy machinery, industrial buildings, and prestressed concrete. A "Contractor's Advisory Service" will also be offered for methods of excavation, sheeting and bracing for deep excavations, concrete formwork, underpinning, dewatering, inspection, and supervision of construction.

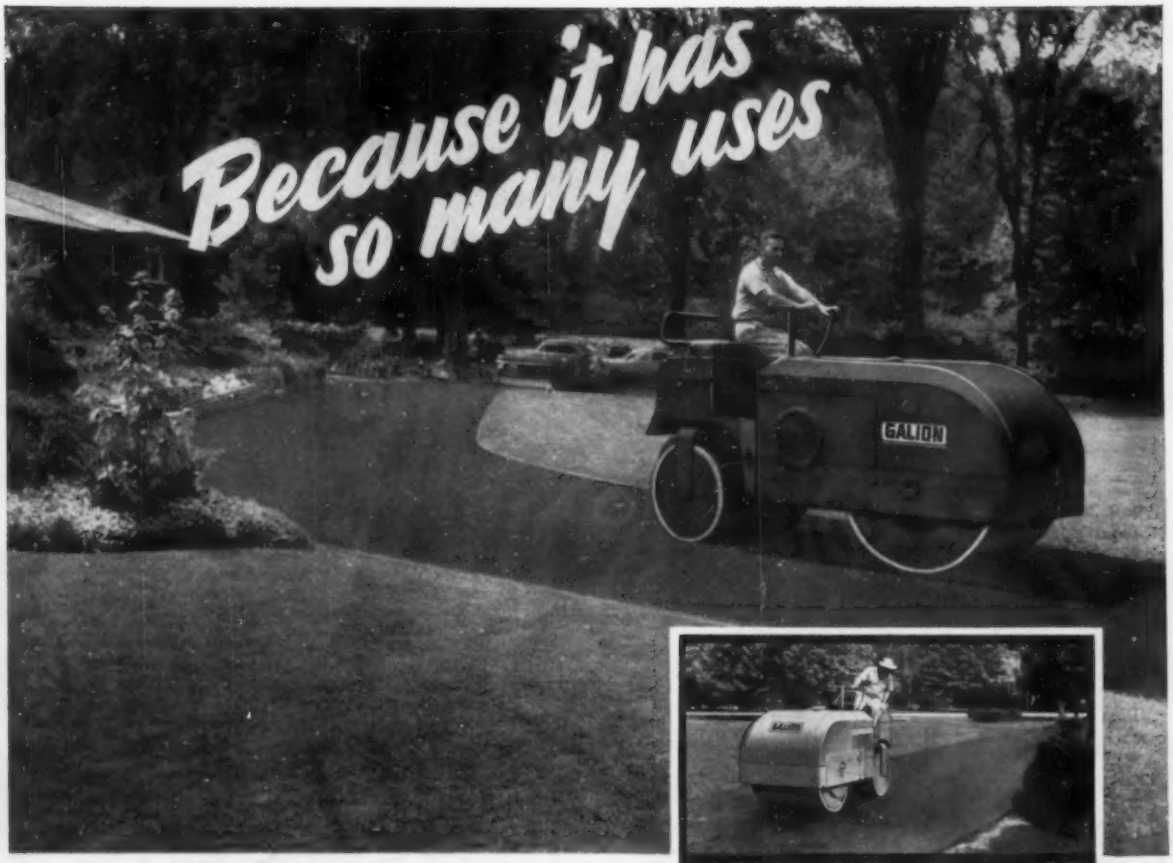
Mr. Sherman will continue to teach one afternoon a week at the University of Mississippi School of Engineering, where he has been Professor of Civil Engineering for the past four years.

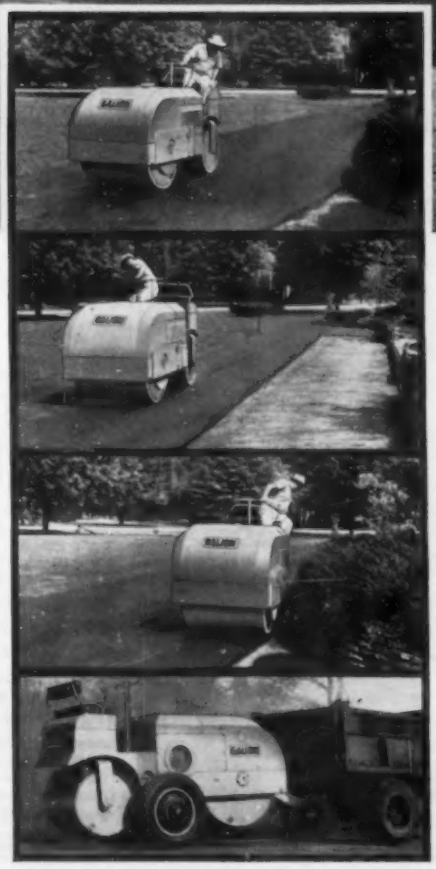
HARRY J. KIRK, who has served on the national staff of The Associated General Contractors for many years, is retiring. Recently, he was manager of the A.G.C. Accident Prevention Department, and is credited as a chief influence and also largely responsible for the forward strides made in safety promotion work by this association.

Kirk, who is a former highway director of Ohio, is succeeded by Arthur L. Schmuhl, who has been assistant manager of the A.G.C. Accident Prevention Department.

● The contract for 325 50-watt 2-way radio phones has been awarded by the California division of highways for use by the California highway patrol.

These units, which are "T-power" Motorola units, reflect a trend in transistorization of mobile radio equipment.





AND BECAUSE IT IS ECONOMICAL AND EASY TO OPERATE, contractors, state highway departments, counties, cities, villages, and airports use it more than any other roller.

Contractors make it pay for itself over and over when they buy the transport attachment and move it quickly from job to job. Write for literature.

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THE GALION IRON WORKS & MFG. CO.
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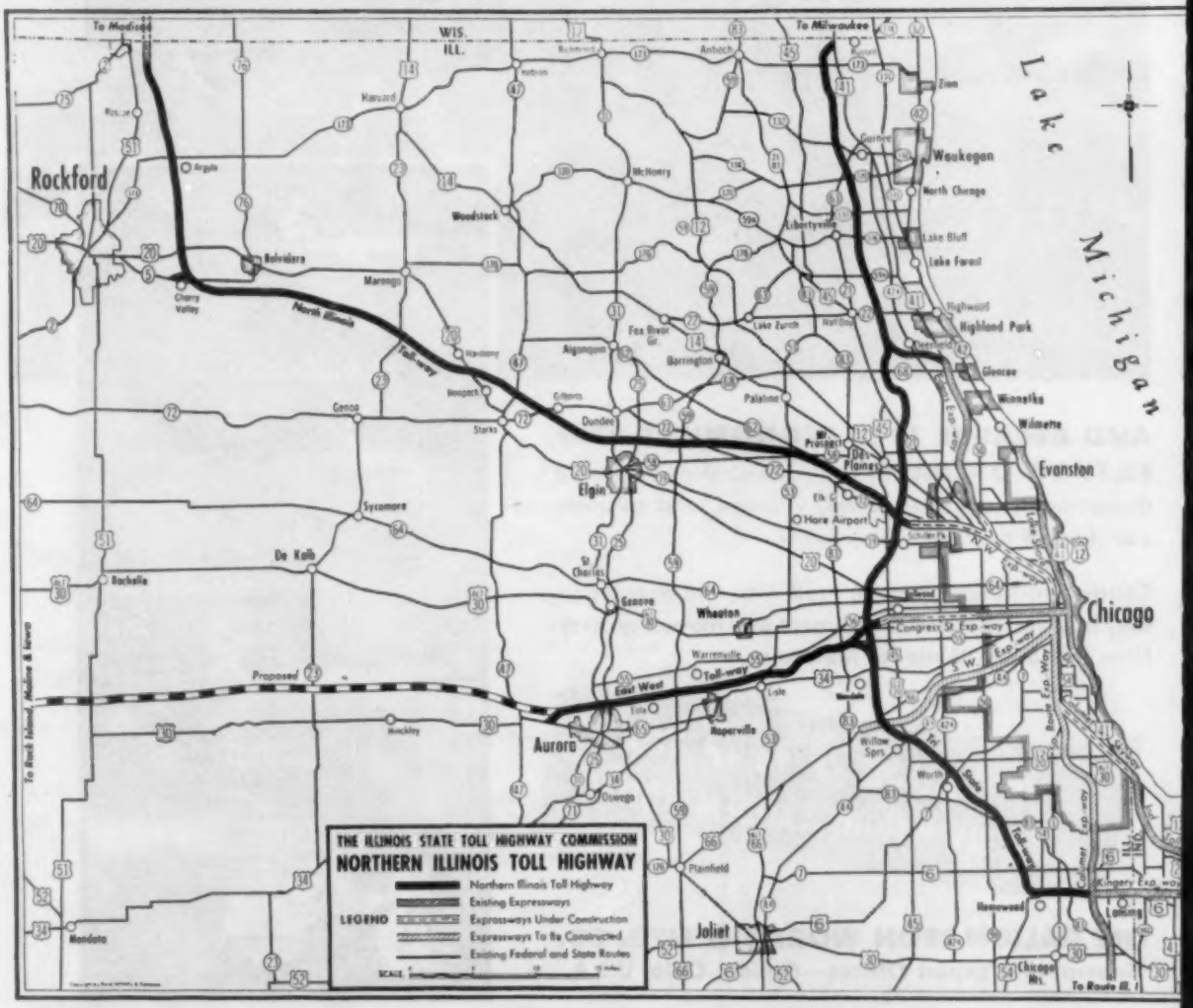
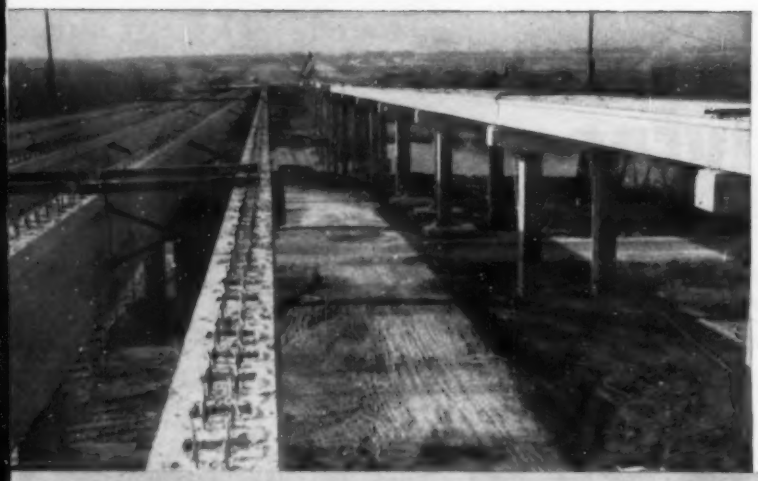
On The Northern Illinois Toll Highway

Prestressing Saved Millions



The Northern Illinois Toll Highway is the largest addition to America's rapidly expanding highway system. Approximately 200 miles of interconnected construction will link the Indiana Toll Road with a bypass of Chicago, and give quick access to Milwaukee and Madison, Wisconsin, and Aurora, Illinois.



Fox River Bridge—This bridge, near Elgin, Illinois, stretches 1381′7″ across the Fox River. It contains 150 concrete beams, prestressed with USS American Super-Tens Stress-Relieved Strand. These huge beams are 92′ long, 2′ wide, and 5′ deep. These are the people who built this bridge:

Designers and Engineers: Alfred Benesch & Associates, Chicago.

Consulting Engineer: Joseph K. Knoerle & Associates, Chicago and Baltimore.

Construction Contractors: Arcole Midwest Corp., Evanston, Illinois.

Prestressed Concrete Supplier: Materials Service Corp., Algonquin, Illinois.

These are the other Prestressed Concrete Suppliers: Lewistown Midwest Division, American-Marietta Company, La Grange, Illinois.

Midwest Prestressed Concrete Company, Rochelle, Illinois.

Consumers Company, Hodgkins, Illinois.

18,000,000 feet of prestressing steel in 224 bridges is USS American Super-Tens Stress-Relieved Strand

THE USE OF PRESTRESSED CONCRETE MEMBERS for bridge construction has saved millions of dollars in building the Northern Illinois Toll Highway (Seventh Quarterly Progress Report of The Illinois State Toll Highway Commission). 224 new bridges along this new super-road will include a total of 18,000,000 feet of USS American Super-Tens Stress-Relieved Strand.

Beams and slabs for these bridges were prefabricated at prestressing plants, then shipped to the job sites for immediate installation. None of these bridges will ever need painting or maintenance because they are made of prestressed concrete. Prestressing wire and strand exerts a permanent compressing force . . . insures durable, crack-resistant, maintenace-free concrete construction members. In addition, guaranteed delivery means you receive prestressed concrete just as it is needed for construction.

Prestressed concrete has already been applied to all types of building construction as well as to bridges. Its future possibilities are almost unlimited.

For engineering assistance, or for more information on a complete line of prestressing wire and strand, call America's pioneer in the development of strand for prestressed concrete: American Steel & Wire. Or write to American Steel & Wire, Rockefeller Building, Cleveland 13, Ohio.

USS, American and Super-Tens are trademarks

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Removable Gooseneck
Model RG
15 to 35 ton capacities

Dorsey's patented hydraulic system makes one-man operation a practical reality, which means a driver can load and deliver self-propelled equipment without assistance.
A self-contained hydraulic power unit is now standard on the RG, which means it can be pulled by any tractor.
20" tires and full spring tandems are also standard, making RG ideal for highway operations as well as on rough terrain.
Deck can be raised or lowered while loaded and in transit to pass over or under obstructions.

New Dorsey
HYDRAULIC DUMP TRAILER

Frameless design adds thousands of pounds of payload capacity to the Dorsey Dump Trailer, and it's ruggedly built to stand up under the extra tonnage it can haul.

Heavy-duty telescopic hoist is placed at the extreme front to utilize the tilt principle instead of lift, reducing strain and wear on hoist and hydraulic system.

High-strength steel arms stablize the unit when dumping. During last degrees of lift, tandem front wheels are raised and weight rests solidly on rear axle with springs out of action.

For the full details on any of Dorsey's complete line of heavy-duty trailers, call your Dorsey Low Bed Distributor or write direct.

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New Publications

AGC Issues Pump and Mixer Revised Standards

The Associated General Contractors of America has published the 23rd revision of its Concrete Mixer Standards and the 11th revision of its Contractors Pump Standards.

The Concrete Mixer Standards were first prepared by the Mixer Manufacturers Bureau, an affiliate of the AGC, in 1924 and now include specifications for construction mixers, paving mixers and plaster and mortar mixers.

The Contractors Pump Standards cover specifications for diaphragm and self-priming centrifugal pumps and were first prepared by the Contractors Pump Bureau, an affiliate of the AGC, in 1937.

These standards, which are widely used by procurement agencies and contractors alike, are revised as the need occurs to meet changing industry conditions. The members of the two bureaus must comply with the standards, and their compliance is indicated by a rating plate, issued by the AGC, for attachment to the machines.

New Building Handbook

A major new work in building construction literature is the "Building Construction Handbook", Frederick S. Merritt, Editor-in-Chief, and Senior Editor of Engineering News-Record.

This volume with 851 pages, 6x9, 183 tables, 423 illustrations, is priced at $15.00, with monthly payments arranged.

McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N.Y.

ACI Concrete Primer Revised

Expanded to 72 pages, the revised ACI Concrete Primer is now available. Price $1.00. American Concrete Institute, P.O. Box 4754, Redford Station, Detroit 19, Michigan.

The primer retains its handy pocket size as well as the question-and-answer form. It develops in simple, concise terms the principles influencing concrete mixtures, and shows how a knowledge of these principles can be applied to the production of permanent structures in concrete.

(Continued on page 36)

WILL STORMS STRIKE EARLY THIS YEAR?

You can prevent costly tie-ups like this by ordering your Sterling Rock Salt—today!

Last year, many towns were caught without rock salt when early storms hit! Traffic was paralyzed, business suffered heavy losses, accidents mounted! Don't let it happen in your area this fall!

Order enough Sterling Rock Salt now so you're fully prepared for unexpected early storms; so you won't run out of rock salt when you need it most. When you have Sterling Rock Salt on hand—ready for use—you help prevent costly business losses, keep traffic moving safely on your streets and highways.

Straight Sterling Rock Salt is a powerful *melting* agent. It helps turn snow into slush—quickly. And when ice forms, salt crystals bore through the ice layer to the road surface. Here, brine is formed and spreads out to break the bond between ice and pavement! Ice can be easily removed—so you get a bare, safe pavement!

Sterling Storite keeps rock salt from caking in outside storage! This amazing chemical agent protects uncovered or covered stockpiles, so the rock salt is *always* free-flowing. Thanks to Storite, early ordering and stockpiling is even more practical!

A free booklet gives full details on Sterling Storite. Ask your International representative or write for your free copy today.

To order your Sterling Rock Salt now, contact your International representative . . . or the sales office nearest you.

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the profit you left behind

There it lays in the dirt. Your machines and equipment ground off in the grit, pounded off in the rock. You can almost see the wear that shut down your machines too soon . . . idled your men too long . . . bled your profits too much.

Is there *one* material, *one* metal that can stop this excess wear waste?

One? It takes many alloys, engineered alloys (some you may never have heard of). It takes a list of Amsco® Alloys to span the entire range of wear applications.

Amsco Alloys that can work a full shift where severe abrasion knocked out toughest metals in three hours. Amsco Alloys that can belt rock all day, and work tomorrow, too. Amsco Alloys that can work any abrasion-impact combinations you face and still resist the wear, stop the waste . . . save the profit in the job.

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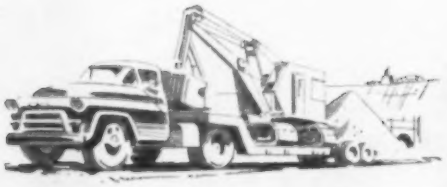

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Eaton 2-Speed Axles Will Do It!

Eaton 2-Speed Axle trucks make quicker, full-load trips—with no sacrifice of power when it's needed to pull out of the tough spots. But they do more than save time; they save money, too. With double the conventional number of gear ratios right at their finger tips, drivers use the *right* gear ratio for every operating condition. This lets engines operate in their most efficient and economical speed range; stress and wear are reduced right down the line from the engine to the axle itself. Operating and maintenance costs are cut to the bone. And through improved maneuverability and reduced driver fatigue, Eaton 2-Speed Axle trucks make not only *quicker* trips but *safer* ones. They haul more at lower cost per mile, last longer, and are worth more when traded in.

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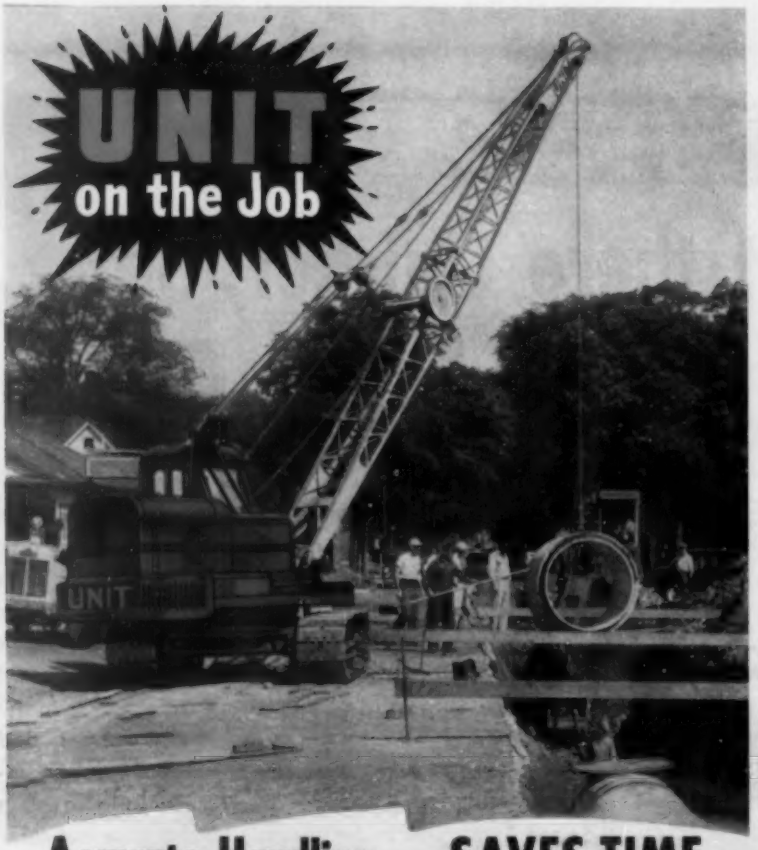

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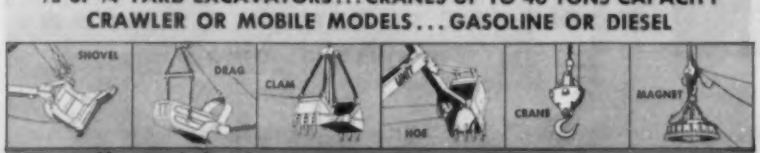

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New Publications

(Continued from page 32)

The additions to the primer cover the concept of air entrainment, recognition of reactive aggregates, use of several cement types, and high-frequency vibration in the placing of fresh concrete. Major emphasis, as in the earlier edition, is given to the basic principles and logical procedures for the proportioning of concrete mixtures. The progress of technology is reflected in the expanded section on mixing time, covering transit mixing and new mixer designs.

Electronic Data as a Management Aid

Cost Control Through Electronic Data Processing By Phil Carroll, Price $1.50 per copy, address Research Division, Society For Advancement Of Management, 74 Fifth Avenue, New York 11, New York.

Booklet outlines the practical rules of question-asking (programming) and corrective managerial action in the use of EDP as a cost-control instrument. He covers Systems and Procedures; Sales Forecasts; Production Scheduling and Control; Expense Budgeting; Direct and Indirect Costing; and the development of Decision-making ability in the managerial staff.

"Estimating Construction Costs", by R. L. Peurifoy, 446 pages, $10.75. McGraw-Hill Book Company, 330 West 42nd St., New York 36, N.Y. This second edition includes a wealth of basic data on production rates for labor and equipment, costs for many types of construction equipment, indirect costs such as insurance, etc. The new edition contains new data on Workman's Compensation Insurance and related subject matter, production rates applied to labor, and a more complete coverage of all building trades.

Flexible Pavement Studies and Georgia Design Practice. Bulletin 177. Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $1.20.

Contains three papers as presented at the Board's 36th Annual Meeting:

(Continued on page 39)

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Unique to Reo and its complete line of Gold Comet engines, V-8's and 6's—is its advanced "wet-sleeve" replaceable cylinder construction. This design, together with the special alloy materials used and close tolerances to which pistons and cylinders are uniformly controlled, assures unsurpassed cylinder wall life. **Unlike conventional engines, a Reo engine never requires re-boring.** When it reaches the point of overhaul, it can be restored to its original standards of performance by any mechanic with the use of low cost factory matched cylinder-piston kits. Advanced "wet-sleeve" construction is another way in which important hidden values are built into every Reo engine . . . gasoline, LP-Gas and Diesel.

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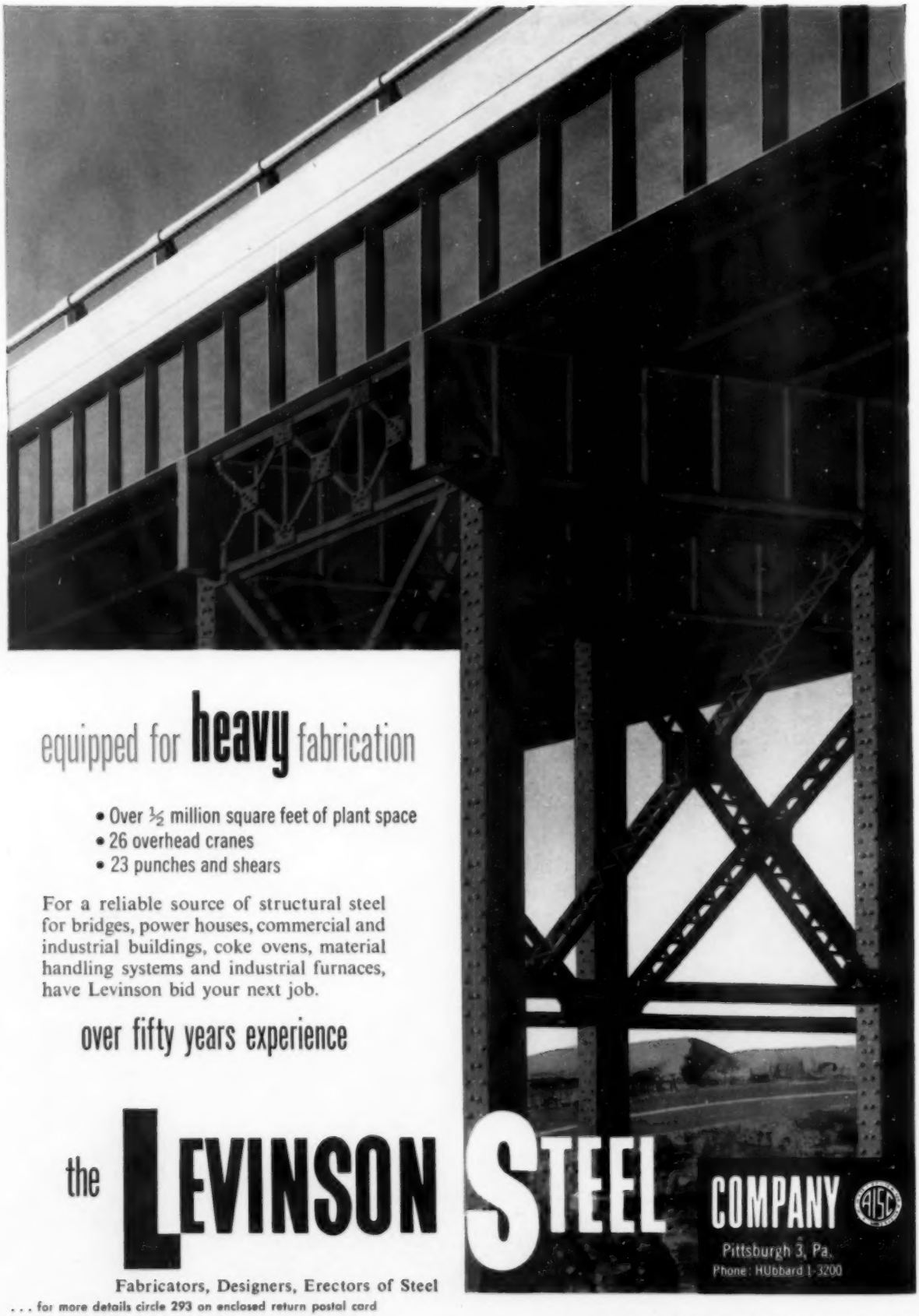

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New Publications

(Continued from page 36)

(1) By Stuart Williams and Allan Lee; describes pavements studied, test procedure and results to date on a cooperative program of load-deflection tests of several high-type flexible pavements in Maryland.

(2) By W. F. Abercrombie; describes basic factors considered and manner of incorporation into flexible pavement design by the state highway department of Georgia.

(3) By Donald M. Burmister; evaluates the pavement system (subgrade, subbase, pavement) for the WASHO Road Test by layered system methods as developed by the author.

Revised Standard for Power Cranes and Shovels Issued

The new edition of Power Cranes and Shovels, Commercial Standard CS90-58, is now available, according to the Commodity Standards Division, U.S. Department of Commerce. It applies to machines of the convertible full-revolving type on crawler, truck and wheel mountings. Sizes are in the so-called "commercial" ranges for shovels and cranes, with provisions for clamshell, dragline, pile driver and hoe operation.

The new standard is a revision that combines the former domestic and export standards, in accordance with recommendations of the Power Crane and Shovel Association, and has been widely endorsed by others in the industry. Its chief purpose is to establish uniform methods for guidance in specifying features of the machines, and in presenting data concerning their construction, performance, and control. The standard includes safety requirements, recommendations for export, labeling, certification of compliance with the Commercial Standard, and definitions of terms peculiar to the industry.

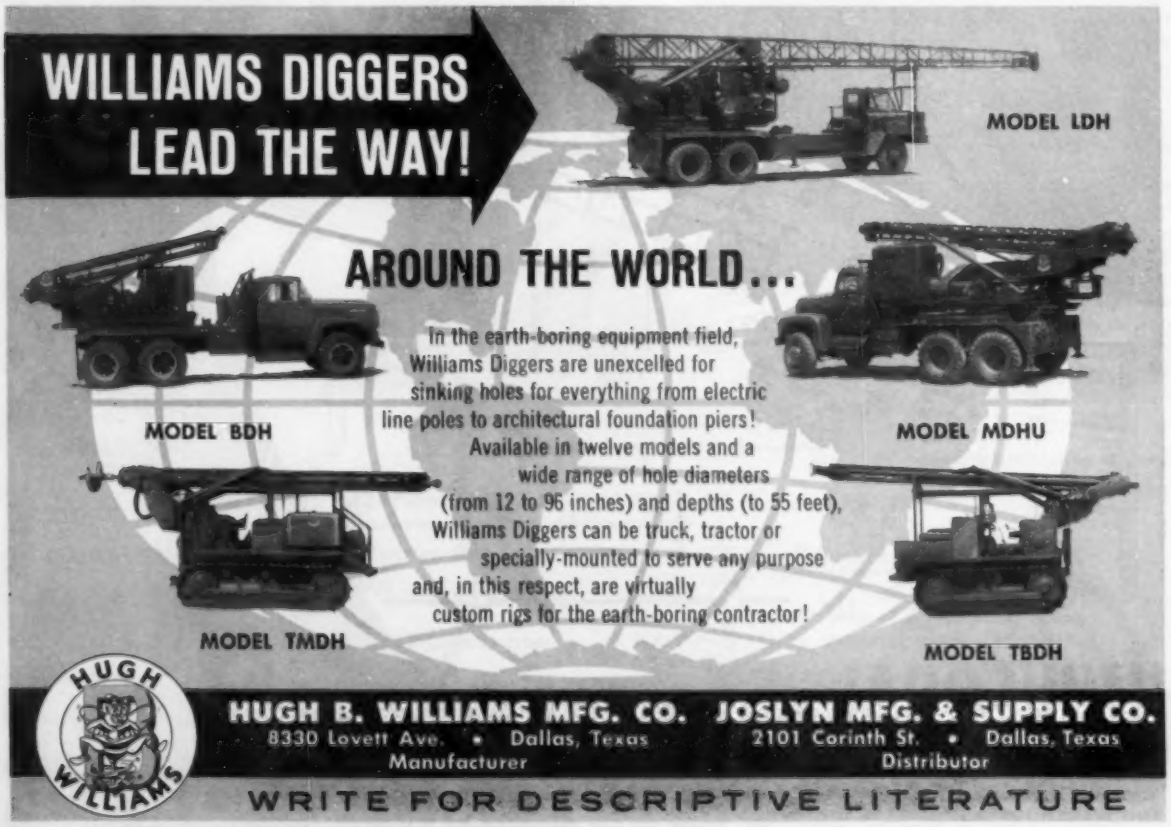
Copies of CS90-58 may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 20 cents per copy.

RECENT ADVANCES IN THE ENGINEERING SCIENCES; THEIR IMPACT ON ENGINEERING EDUCATION. Proceedings of a conference on science and technology for Deans of Engineering, 1957, Purdue University, Lafayette, Indiana; this 257 page report is available at $4.75. McGraw-Hill Book Company, 330 West 42nd St., New York 36, New York

ANALYSES OF SOIL FOUNDATION STUDIES. Bulletin 173. Highway Research Board, 2101 Constitution, Washington, D.C. Price $2.00. The expanded highway program will doubtless call for higher, more massive embankments than heretofore. Some of the embankments, particularly in coastal areas, will of necessity be constructed over soft foundation soils that present special problems in design and construction.

Cognizant of these possibilities, two HRB Committees (Stress Distribution in Earth Masses, and Survey and Treatment of Marsh Deposits) sponsored the five papers presented in this Bulletin. These papers concern facets of the overall problem of design and construction over soft foundation soils.

(Continued on page 43)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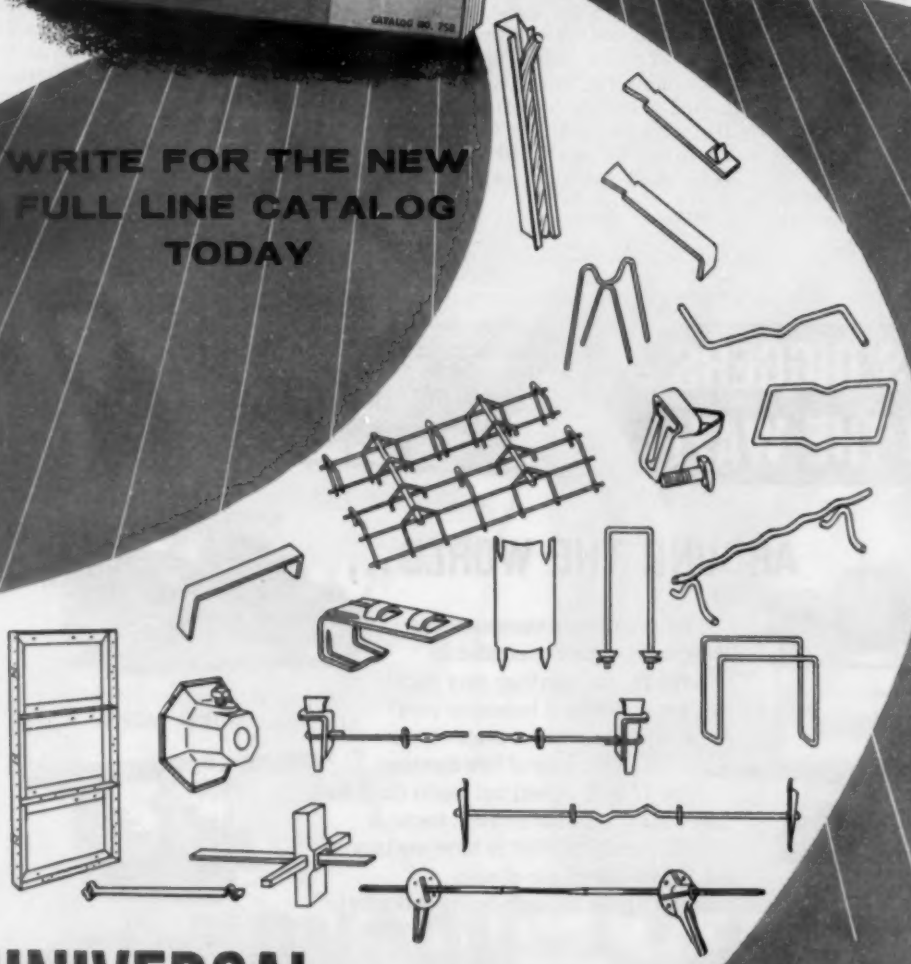

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New Pre-Screening Attachment

gives Cedarapids Commander

GREATER VERSATILITY... HIGHER CAPACITY

Now your Cedarapids Commander — the next one you buy or the one you have on the job — can be equipped to remove fines from the circulating load and give you additional flexibility in meeting specifications calling for high percentages of crush while maintaining the plant's normal high capacity.

The secret is the new Cedarapids Pre-Screening Attachment. It's the most efficient accessory available to make the operation of a single portable tandem plant not only economically practical, *but profitable*, where the finished product must be up to 100% crushed, or in low grade material where fines are excessive.

It will pay you to get complete information about the competitive advantages this new attachment will give you for a comparatively small investment. Your Cedarapids dealer has all the details. See him today, or write to Iowa Manufacturing Company for information.

This Cedarapids Commander Crushing and Screening Plant, equipped with Pre-Screening Attachment, produced ¾" specification aggregate from a pit with high percentages of fines at a 170 ton per hour clip. The plant is owned by Pioneer Construction Company of Pueblo, Colorado.

Apply these Pre-Screening Advantages to Your Operations

- **Removes or by-passes excessive fines or dirt.**
- **Meets specifications calling for 100% crushed aggregate with three product sizes.**
- **Permits production of high type specifications from poor, contaminated pits.**
- **Increases plant capacity and cuts crusher maintenance by reducing the circulating load.**
- **Adds 80% more screening area to portable Commander and Junior Tandem plants.**
- **Handles high volumes of sand, or by-passes acceptable fines around plant for further processing.**
- **Combined with plant, will produce 5 sizes of finished product.**

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Because snow plows travel at high speeds and have to withstand the impact of heavy snow and ice, they must be equipped with really rugged cutting edges.

That's why so many smart snow plow operators insist upon CF&I Cutting Edges. Made from special analysis steel that's carefully selected for its toughness and resistance to abrasion and fatigue, CF&I Cutting Edges are scientifically hot rolled, punched and inspected to make sure that each blade is perfect.

CF&I Cutting Edges come in a variety of lengths, widths, thicknesses and hole spacings; flat or curved; with beveled or square ends, and in different finishes. Next time, it'll pay you to to discuss your needs with your nearby CF&I representative.

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EASY TO INSTALL—CF&I Scarifier Blades can be properly positioned without placing the moldboard at an angle.

EASY TO USE—CF&I Scarifier Blades have a straight-tooth design so you can change direction of discharge without the troublesome blade-changing required with other scarifier blades.

DESIGNED FOR MAXIMUM EFFICIENCY—CF&I Scarifier Blades have five teeth per running foot to gain maximum efficiency in ice removal.

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CF&I OFFICES IN CANADA: Montreal • Toronto

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New Publications

(Continued from page 39)

INSTRUMENTATION FOR MEASURING CHARACTERISTICS OF CONCRETE. Bulletin 126. Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $0.60.

Contains three papers presented at the Board's 36th Annual Meeting:

(1) By G. E. Monfore; describes a new type of standardizing unbonded elastic wire strain gage that can be surface-mounted or embedded in concrete for measurements requiring long-term stability.

(2) By George Verbeck and Paul Klieger; describes the development and operation of a calorimeter-strain apparatus for study of freezing and thawing concrete.

(3) By W. E. Grieb; describes the AE-55 indicator (Chace air meter), a pocket-sized device intended for use in the field to estimate the air content of plastic concrete.

COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE: FOR BRIDGES AND BUILDINGS. By Ivan M. Viest, Bridge Research Engineer, AASHO Road Test; R. S. Fountain, Bridge Consulting Engineer, Portland Cement Association; and R. C. Singleton, Vice President of Engineering, Nelson Stud Welding, Divsion of Gregory Industries, Inc. 192 pages, 6 x 9, 39 illustrations, $7.50. McGraw-Hill, Industrial and Business Book Information Service, 327 W. 41st St., New York 36, N.Y.

An engineering manual on the design of steel beams and concrete slabs for composite construction, showing the advantages of the method and fully covering design procedures and practical applications.

DEVELOPING CONCEPTS OF LAND ACQUISITION. Bulletin 169. Highway Research Board, 2101 Constitution Ave., Washington, D. C. Includes a report of the committee on this subject, and four papers presented at the board's meeting in January, 1957. Price $1.60.

DRIVER CHARACTERISTICS AND BEHAVIOR STUDIES; bulletin 172. Includes six papers on the subject presented at the 36th Annual Meeting of Highway Research Board. Price $2.40 remitted to the Board at 2101 Constitution Avenue, Washington, D. C.

Job Safety

Portable Electric Equipment Must Be Well Grounded

Is your portable electric equipment properly grounded? If not, burns and death-causing shock may result, according to the National Safety Council.

Indirect injuries, too, may arise from use of ungrounded portable electric equipment if it's defective. For example, a workman received a slight shock from a defective tool and dropped it on his foot—suffering a painful injury. Slight shocks also have caused fatal falls from heights. Common portable electric equipment which often is used in homes as well as industry include drills, abrasive tools and saws.

To reduce the danger of electrical shock, it is important that a separate ground wire be provided from the tool to a low-resistance ground connection. Water pipes, metal framework of buildings, or other metal structures in direct contact with the earth, may be used to ground equipment.

Here are some suggestions on grounding portable electrical equipment:

1. When wiring is enclosed with metal conduit or protected by armored cable, all couplings and fittings used to make connections between the conduit or cable and the electrical equipment should provide metal-to-metal contact to assure a continuous ground return.

2. If the wiring is nonmetallic sheathed cable or knob and tube work, such as is used in construction work—a third wire must be connected to the grounding terminal on the receptacle to provide a good conducting path to a grounding electrode or water pipe.

3. Grounding wires should be checked to see that the size is correct for the capacity of the nearest fuse or other automatic cutout.

4. No fuses, automatic cutouts or hand-operated switches should be inserted in a grounding line.

To ensure automatic use of the ground, a common type of plug with a U-shaped grounding blade and two standard parallel polarized blades now can be used.

The foregoing and additional information are contained in Data Sheet D-299, *"Grounding of Portable Electric Equipment,"* one of many prepared periodically by safety engineers. Write National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

New Job Safety Signs Adopted in Michigan

Red flags will no longer be seen in the hands of flagmen helping motorists through roadbuilding jobs in Michigan. The red flag was abolished by the state highway department beginning this spring, as part of an overhauling of its traffic control technique for road construction projects.

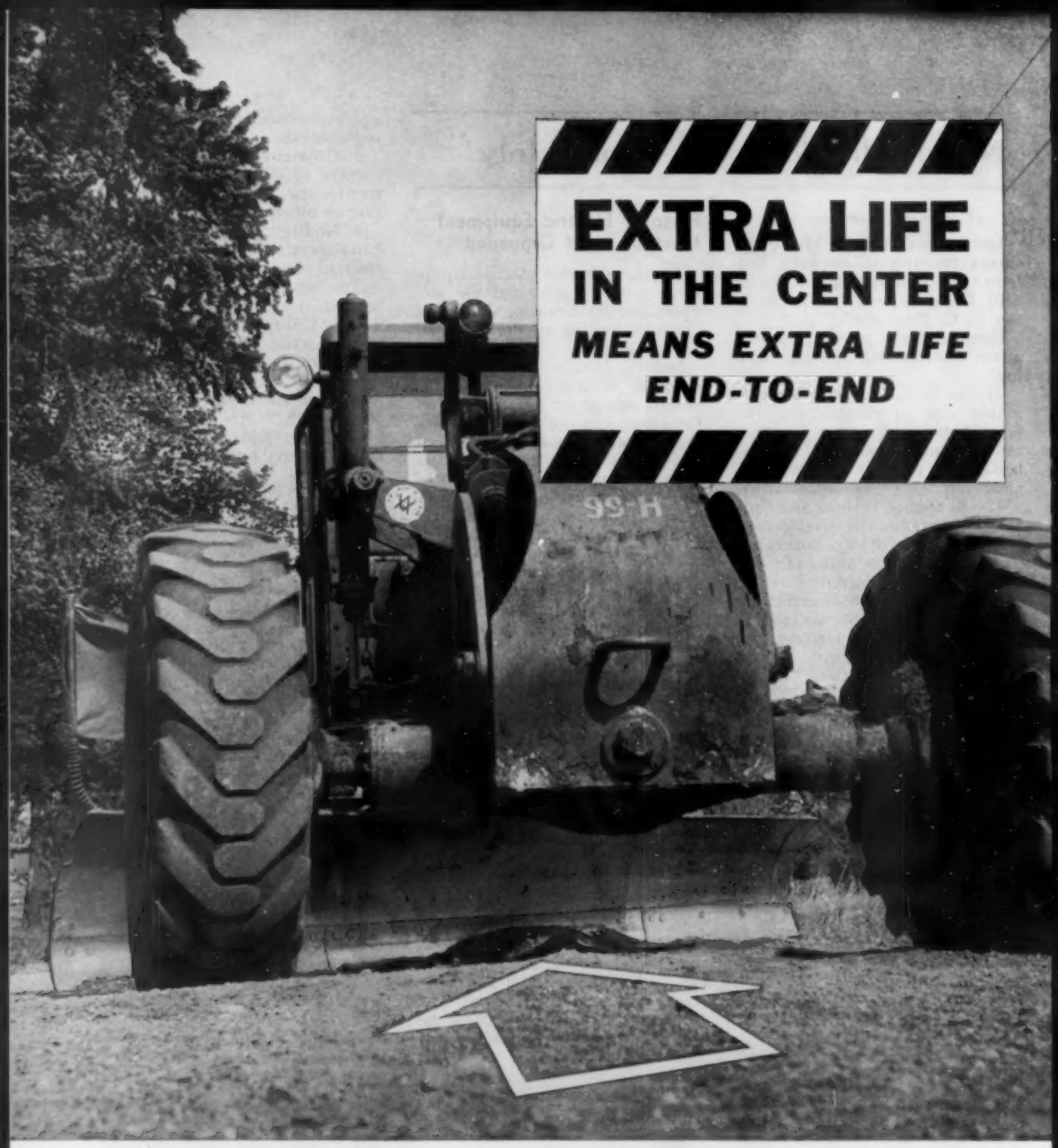
In place of the red flag, a standardized "Stop" and "Slow" sign will be used, along with a highly visible black and yellow checkered vest for the traffic "regulator" as he will be called.

The red flag was abolished because of the experience showing that motorists are often confused by them, and that a safety hazard is created, rather than diminished. The checkered vest will command attention from approaching drivers, it is hoped.

CUT YOUR BLADE COSTS 40% to 60%

Read the next 2 pages

Mail coupon on next page



PAPER, CALMENSON & CO., Department L
County Road B and Walnut St., St. Paul 13, Minnesota

Please send me additional information on savings to be made with Pacal 3-piece blade arrangement and quote me comparisons on sections I'm using now.

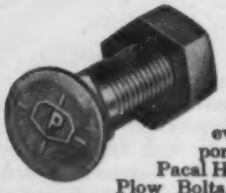
Number of graders_____ Length of mold boards_____

Size of blades in use_____ Type of work done_____

Name_____

Organization_____

Address_____



* NOW! More than ever it's important to use Pacal Heat Treated Plow Bolts. With the longer life of X-TRA-EDGE blades you need a bolt that has a head as hard as the blade. Pacal Heat Treated Bolts have triple strength . . . do not stretch or loosen.

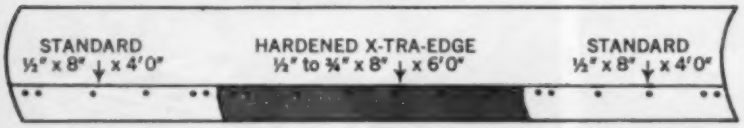
PACAL Announces New 3-piece grader blade arrangement with hardened X-TRA-EDGE

CUTS COSTS 40% TO 60%

CONQUERS EXCESS CROWNING

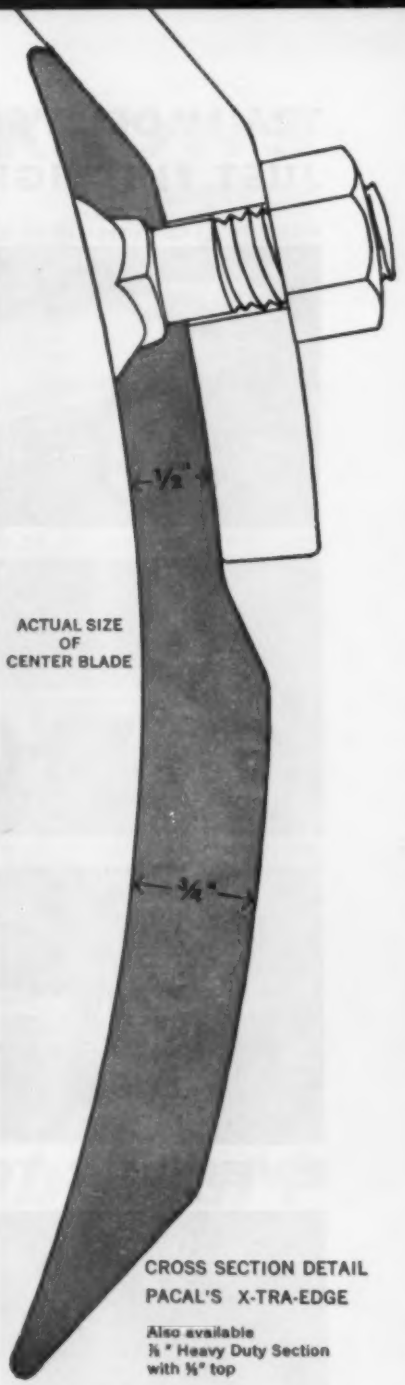
With Pacal's new 3-piece grader blade arrangement you get extra life in the wear-taking center section in 2 ways: 1. through the extra cutting-edge thickness of Pacal's X-tra-edge blade construction, 2. through the special hardening of the cutting-edge steel by heat treatment. Instead of two sections, you use three: a hardened X-tra-edge section in the center—shorter standard double-beveled blade sections at each end.

EXAMPLE: 14' Mold Board



Pacal's new 3-piece, flush-joint blade arrangement is also available with ⅜" to ⅛" hardened X-TRA-EDGE center section and ⅛" standard blade sections at each end. Combinations for all mold board lengths.

Exhaustive operating tests over a period of 4 years have proved blade costs can be cut 40% to 60%. The new Pacal blade arrangement prevents excess crowning, keeps a sharper cutting edge, reduces end-gouging and other work slow-ups, makes your equipment and operators' time count for more in material moved and miles of smooth roadway completed. Much less down-time per year for blade changes—much less bolt cost*—much less blade cost. Get full information. Mail coupon today.



ACTUAL SIZE OF CENTER BLADE

CROSS SECTION DETAIL
PACAL'S X-TRA-EDGE

Also available
⅜" Heavy Duty Section
with ½" top

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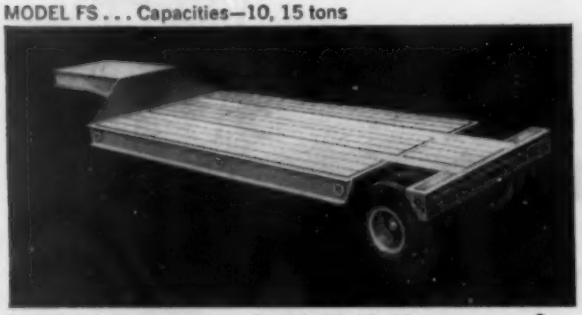
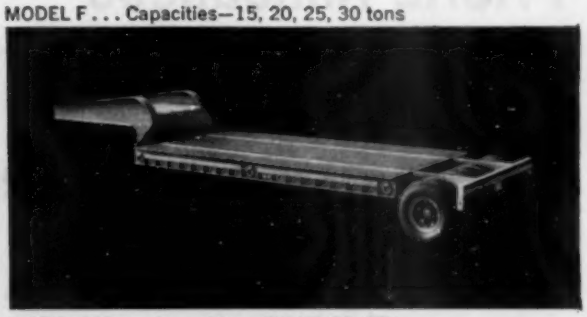
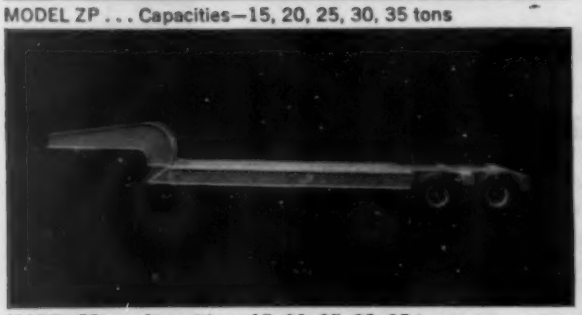


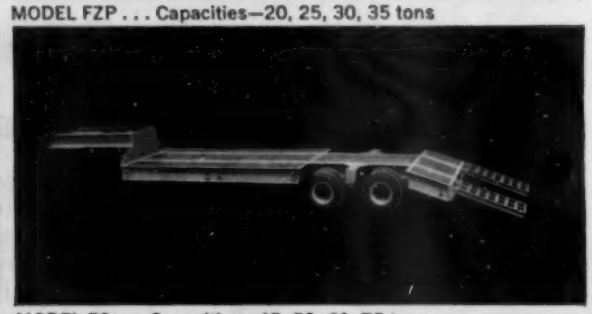
MODEL F . . . Capacities—15, 20, 25, 30 tons



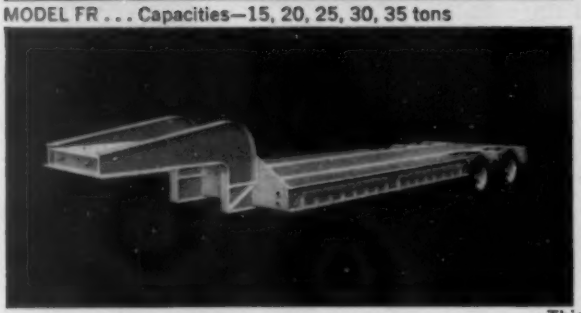
MODEL ZP . . . Capacities—15, 20, 25, 30, 35 tons



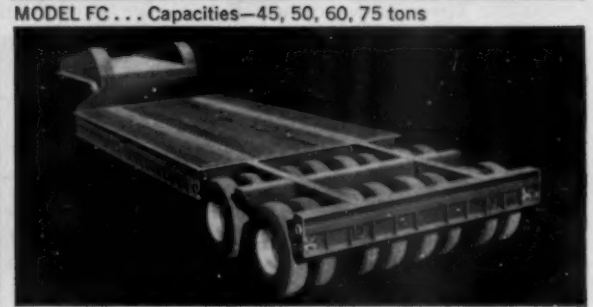
MODEL FZP . . . Capacities—20, 25, 30, 35 tons



MODEL FR . . . Capacities—15, 20, 25, 30, 35 tons



MODEL FC . . . Capacities—45, 50, 60, 75 tons



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Meetings

PRESTRESSED CONCRETE INSTITUTE—Annual Convention, Edgewater Beach Hotel, Chicago, Ill.; September 21-25.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA—Mid-Year Board Meeting, Atlanta, Ga.; September 22-24.

FREEWAY OPERATIONS SEMINAR—Institute of Traffic Engineers, Northhampton, Mass.; September 24-26.

AMERICAN PUBLIC WORKS ASSOCIATION—Annual Meeting, Muehlebach Hotel, Kansas City, Mo.; September 28-October 1.

ANNUAL COUNTY CONFERENCE, American Road Builders' Association, Concord Hotel, Kiamesha Lake, N.Y.; September 29-October 1.

CANADIAN GOOD ROADS ASSOCIATION—39th Convention, Queen Elizabeth Hotel, Montreal, Canada; September 30-October 3.

CONFERENCE ON ROADSIDE DEVELOPMENT, Ohio Department of Highways and Ohio State University, Columbus, Ohio; October 7-10.

AMERICAN SOCIETY OF CIVIL ENGINEERS—Annual Convention, Hotel Statler, New York, N.Y.; October 13-17.

REMINGTON RAND UNIVAC USERS CONFERENCE—Meeting at Office of John Hancock Mutual Life Insurance Co., Boston, Mass.; October 20-21.

NATIONAL SLAG ASSOCIATION—41st Annual Meeting, Mayflower Hotel, Washington, D.C.; October 21-22.

INTERNATIONAL ROAD FEDERATION—Third World Meeting, Mexico City, Mexico; October 26-31.

INSTITUTE OF TRAFFIC ENGINEERS—28th Annual Meeting, Deauville Hotel, Miami Beach, Fla.; November 11-13.

CONFERENCE ON ELECTRONIC COMPUTATION, sponsored by ASCE Structural Division Kansas City Section, Continental Hotel, Kansas City, Mo.; November 20-21.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—Annual Convention, Sheraton-Palace Hotel, San Francisco, Calif.; November 29-December 2.

● Traffic regulations adopted for Illinois' 187-mile tollway include a *minimum* speed limit of 40 mph for the entire road. Maximum limits for cars will be 60 to 70 mph, depending upon the area. Limits for buses will be 60 mph, trucks 55.

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"We always use Flexcell. We like the way it works, the way it wears," says W. E. Riggin, chief project engineer for Lipsett Construction Company. Shown at the Vine Street Extension, a major link in the new Philadelphia Expressway system, Mr. Riggin is here supervising work on the project, which includes seven bridges crossing the expressway.

Flexcell bituminous impregnated fiber board bonds firmly to concrete, compresses without extruding. Re-expands to keep joints filled, preventing intrusion of dirt and stones. Uniform asphalt impregnation, 35% by weight minimum. Unaffected by temperature extremes. Tough, rigid, light in weight. Easy to cut and install. Fabricated to your specifications.

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Court Decisions for Contractors

Value of Oral Promise for Increased Payment for Work

Minimum wage rates listed by a New York state proposal for a highway construction contract stipulated $1.95 per hour. Labor costs were estimated at this rate in the execution of a contract for the reconstruction of the Geneva-Lyons state highway in that state.

Union representatives, a few days after this work had commenced, demanded as a condition of continuing work an increase of 20 cents an hour. Reporting this demand to the general contactor, the paving subcontractor demanded that his payments under the contract be increased by one half of this amount, to which the general contractor agreed. Upon completion of the contract, payment of this increase was refused and the subcontractor sued.

It was the contention of this general contractor that there was no enforceable contract, due to the absence of any legal consideration for this increase which he had promised. Agreement by the subcontractor to continue on the job was merely agreeing to do what he was legally bound to do.

The contract, maintained the court, might have been abandoned and a new one made under which this promised increase would have been binding but this was not done. "The most that the subcontractor shows beyond the promise," said the court in refusing to allow this additional compensation, "is his reliance upon his capacity to breach the contract and his statement that he would do so if the excess labor cost was not shared.

"Judged from the standpoint of ordinary business morality the situation of the general contractor might be less defensible than that of the subcontractor, but the contract was not terminated and there was no consideration for the promise of this additional amount."

Arzani v. People, 149 N. Y. S. 2d 38, New York, March 1, 1956

Ruling on Equipment Costs

A suppliers suit under 40 U.S.C. 270 on a government construction contract payment bond to recover price of equipment furnished subcontractor cannot be brought in federal district court where supply contract was to be performed since Sec. 270 (b) restricts such suits "to district where the contract was to be performed" refers to districts of prime and not the subcontractor's performance—USDC SNY—Fairbanks Morse & Co. v. Bero Const. Corp. 1/14/57.

Contractor's Liability Limited

Judgment against a Washington state road contractor was reversed by the Supreme Court of that state. Traveling along a gravelled detour, a motorcyclist was thrown when his motorcycle hit a depression. Every few hours this detour had been inspected—the last time less than two hours before this accident —and found by the engineer to be in satisfactory condition.

In its reversal of this judgment the Supreme Court said of the error of the trial court in its charge to the jury, "The charge placed upon the contractor the duty 'to maintain all detour areas in a reasonably safe condition for vehicular traffic.' This instruction placed upon the contractor a greater duty to repair under these circumstances than our decisions require.

"We have held that one charged with proper maintenance of a highway must maintain it in a reasonably safe condition for one who is operating a motor vehicle in a lawful manner and exercising due care for his own safety under the circumstances then and there existing."

Argus v. Peter Kiewit Sons Co., 307 Pac. 2d 261, Washington, February 15, 1957

Intent Part of Contract

A court ruling to this effect was recently handed down in Asphalt Paving Company vs. Githens, 271 SW 92nd) 374. In so ruling, the court declared the written contract void because it did not agree with the original intention of the parties. Under the terms of the original agreement, the contractor purchased concrete for an airport paving job at $1 per sq. yd. The written contract was for $10 per ton. The court set the signed contract aside and held the contractor liable for only the $1 per sq. yd., the price covered by their original agreement.—*Virginia Road Builders Association.*

Profits under Changed Plans

Contract for the construction of a public highway in Uinta County, Wyoming, contained the provision that the state highway engineer had the right to make reasonable changes in the plans but that if such changes increased the cost of performance the contractor should have suitable compensation.

Changes were made and the contractor sued, not for his increased costs but for the profits he would have made under the original plans which had been reduced as a consequence of these changes.

In its refusal to allow a recovery, the Wyoming court said that, supposing the change had been favorable to the contractor and that he had made additional profits, "Would it still be contended that he is nevertheless entitled only to the profits he would have made on the work along the original line of the road . . ."

Snowball v. Maney Bros. & Co., 270 Pac. 167, Wyoming.

Negligence in Resurfacing

When crossing a street in St. Joseph, Mo., a 64-year old nurse of the state hospital stumbled on an asphalt binder coat and fell, fracturing a shoulder bone. Judgment against the contractor and the city for $4,500 was affirmed by the Missouri appellate court.

This asphalt coat had been laid by the contractor two days before and left without barricade or warning. A third of the width of this 30-feet street had been "primed and broomed," a bindery coat laid, rolled by a ten ton roller and the top coat applied. Due to rain the job had been left incomplete with the resurfaced portion raised between one and two inches above the other two-thirds of the pavement.

Of the duty to warn of such conditions the court said, in awarding a recovery to this woman, "If the city's contractor or subcontractor did things to the street or to adjacent streets which rendered travel thereon dangerous or hazardous it became the duty upon notice of such condition to either remedy this condition or to put barriers on this street taking it out of public use or giving notice of its dangerous condition."

Smyth v. City of St. Joseph, 297 S. W. 2d 578, Missouri, January 7, 1957

6 YARDS PER MINUTE WITH A 105 EXCAVATOR

Constructing a dam spillway involves a considerable amount of earth moving. It also presents loading problems because of extremely tight working quarters.

At a dam project, they had been moving earth, consisting mainly of decomposed shale, with ¾ yd. shovels loading from stockpiles pushed up by a bulldozer. In addition, the bulldozer had to rip the earth before dozing. This meant three separate operations — extra equipment tied up — an extremely costly, time-consuming job.

A versatile EIMCO 105 Excavator moved in — flying earth was all that could be seen from then on. The 105 overhead loader walked into the narrow spillway channel, started loading out 6-yard dumptors at the rate of one every 40 seconds — total time lapse for dumptor to move in, be loaded, move out: ONE MINUTE. The bulldozing and ripping operations were completely eliminated — production costs, equipment required, and time consumed were reduced to an absolute minimum.

EIMCO also manufactures a 105 Front End Loader with the same rugged construction and high production rates as the 105 Excavator. Write The EIMCO Corporation for detailed information on EIMCO high production, cost-saving 105 Loaders.

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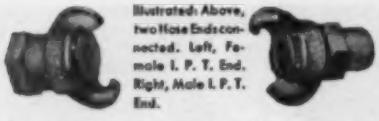
This versatile coupling is built along plain, rugged lines to assure long, trouble-free service under severest working conditions.



Illustrated Above, two Hose Ends connected. Left, Female I. P. T. End. Right, Male I. P. T. End.

The "Air King" will reduce operating costs wherever quick connections are required. Locking heads are identical for all sizes of hose or threaded ends, permitting the coupling of any two sizes of hose within the "Air King" hose end size range, or coupling to any pipe up to 1" by use of the male or female threaded ends. Heads are locked by pressing together and applying a quarter-turn. A patented Safety Locking Device eliminates all risk of the coupling coming apart. Available in bronze or rustproofed malleable iron, in sizes up to 1".

The "Air King" is made to established standards for couplings of this type and is interchangeable with other similar makes.

Also available in 4-Lug style, Hose and Female I.P.T. Ends only, in 1¼", 1½" and 2" sizes.

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More Contractors and Subs in the Road Program

The Bureau of Public Roads has surveyed bidding practices among the state highway departments. Following are some of the policy findings in the expanding highway program:

1. In over half of the states bids are occasionally solicited separately for the construction of different phases of a project, such as bridges, grading and paving. Most states do not permit bidders to condition acceptance of proposals upon the award of more than one contract, but will permit contractors to withdraw unopened proposals before a project reading, after having been read low earlier on other projects.

2. About one-fourth of the states permit bidders the option of bidding on several projects and limiting the overall value of work they will accept at one letting.

3. All states permit subcontracting and equipment rental in one form or another. Some states do not recognize subcontractors as such, but permit prime contractors to utilize them as agents. Subcontracting and equipment rental firms are indicated universally as small business operations. Estimates indicate that 15 to 25 percent of the total volume of contract work is accomplished by subcontract or by utilizing rented equipment.

Subcontracts may accumulate up to 50 percent of the contract amount, and may include specialized types of work. While they vary in size, the nationwide average for subcontracts is estimated to be about $50,000.

4. All states but one report increases in the number of qualified contractors entering the highway construction field, ranging from 5 to 50 percent, with an average overall increase of about 20 percent. Additional increases in the number of qualified contractors are anticipated as the expanded highway construction programs progress.

5. There also is evidence that many contractors are enlarging their capacities to handle either more or larger road contracts.

6. Most state highway departments regularly vary the sizes of highway construction projects in their lettings, to obtain the most efficient and economical utilization of the available working potential of contractors qualified to handle small, medium and large type improvements.

7. For reasons of economy and expediting construction work, it has been desirable to let some contracts of several million dollars each, especially on the Interstate system. Nevertheless, over 95 percent of contract awards are for amounts less than $2,000,000, with the greatest number of awards for primary and Interstate projects falling in the $100,000 to $1,000,000 category.

Secondary projects usually fall within the $25,000 to $250,000 group. There is some variance among the states, due to topography, location, seasonal and other conditions, but the distribution in contract sizes closely parallels the available contractor capacity potential.

Prestressed Concrete Meeting Scheduled for Chicago

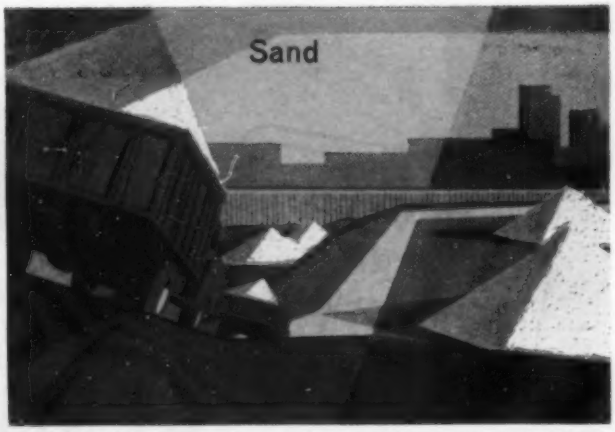
As a sequel to the highly successful World Conference on Prestressed Concrete, held last year in San Francisco, industry leaders have planned the 1958 Annual Meeting and Convention of the Prestressed Concrete Institute in Chicago, Sept. 21-25. The meeting will be at the Edgewater Beach Hotel.

Subjects of panel discussions include interpretation of specifications in relation to job inspections; technical problems in assembling prestressed beams for bridges on the Illinois Toll Road and elsewhere; casting yard problems, long-span prestressed structures; and a report on the Berlin Prestressed Conference and on Prestressed concrete practice in the U.S.S.R.

For registration and other details address: Prestressed Concrete Institute, 1958 Convention Committee, Box 391, LaGrange, Illinois.

Modern Headquarters for Montana Highway Department

The headquarters staff for the Montana highway commission have a new home—the Scott Hart Building, recently dedicated, and named after the recently past state highway engineer of that name. The new building adjoins the old, which continues in use.



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Straight Morton Rock Salt does the job abrasives and mixes can't do

City officials have found that straight Morton Rock Salt is 8 times better than abrasives . . . that one man and one truckload of Morton Rock Salt does a better job of ice and snow removal than 8 men and 8 truckloads of abrasives. Straight Morton Rock Salt (rock salt not mixed with sand, cinders, or other abrasives) leaves no messy residue on streets, in gutters and sewers . . . won't blow away or leave a rutted, dirty pavement . . . needs no flushing after a thaw.

Non-toxic, easy to use, Morton Rock Salt is inexpensive. (It generally costs far less than calcium chloride.)

It pays to order Morton Rock Salt early

Smart purchasing agents, highway officials and city managers know it pays to be prepared before unexpected storms ice streets and highways. They know they eliminate confusion, extra work and accidents by stockpiling Morton Rock Salt early for winter ice and snow removal.

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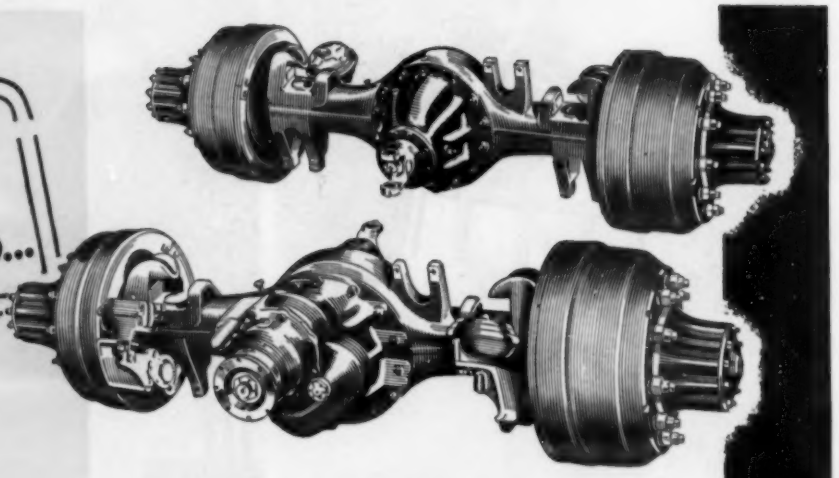

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Timken-Detroit® Lightweight Driving Tandems—First Choice With Big Over-the-Highway Operators!

These superior features make the difference:

Lighter than any comparable tandem on the market . . . but a real heavyweight when it comes to service. Besides increased payloads you get long, trouble-free service and lower operating costs. Time-proved, Timken-Detroit Lightweight tandem features include:

Driver Controlled Inter-Axle Differential. Torque is divided equally between axles, yet wheels of one axle can turn faster or slower than wheels of other axle. This means both axles are always doing equal amounts of work. Driving parts and tires last longer.

"In-Line" Propeller Shaft Drive. With straight-through drive, bearing and gear life is greatly increased because universal joint working angles are materially reduced.

Torsion Flow Axle Shafts. More splines, plus greater root and body diameter, add extra strength.

Hot Forged Rectangular-Shaped Axle Housings. Rectangular shape, combined with full strength corner sections, provides the greatest strength with minimum weight and size. Welded on bowl cover prevents leakage.

Hypoid Gears. Larger pinions and greater tooth contact give 30% more torque capacity, top efficiency and long life . . . plus lower maintenance costs.

Unmatched Parts Interchangeability. Most of the wearing parts—gears, bearings, shafts, differentials, brakes—are interchangeable with parts from Timken-Detroit standard single axles. Parts are readily available and less expensive.

WORLD'S LARGEST MANUFACTURER OF AXLES FOR TRUCKS, BUSES AND TRAILERS

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Slip-Form Paver Lays Reinforced Slab

Special "sled" device developed by the contractors proves successful and opens way for routine placement of reinforced slabs as well as non-reinforced by new formless paving procedure.

By George N. Miles, District Engineer, Colorado Department of Highways, Denver.

THE SLIP-FORM PAVER which has won recognition recently as a means of laying concrete pavement has cleared an important technical hurdle in Colorado: the placement of reinforced slab. A mile of reinforced concrete was placed on an Interstate U.S. 87 project, demonstrating that reinforcement need not deter the use of this economical means of paving. The contracting firms which placed the reinforcing slab developed the "sled" that made the work possible.

The contractors involved are Western Paving Construction Company, of Denver, and the Roberts Construction Company, of Lincoln, Nebraska, combined low bidder ($1,016,154) for 15.3 miles of paving on U.S. 87 between Denver and Castle Rock. This work was to complete a two-lane 24-ft. roadway paralleling the existing two lanes to provide for a four-lane facility.

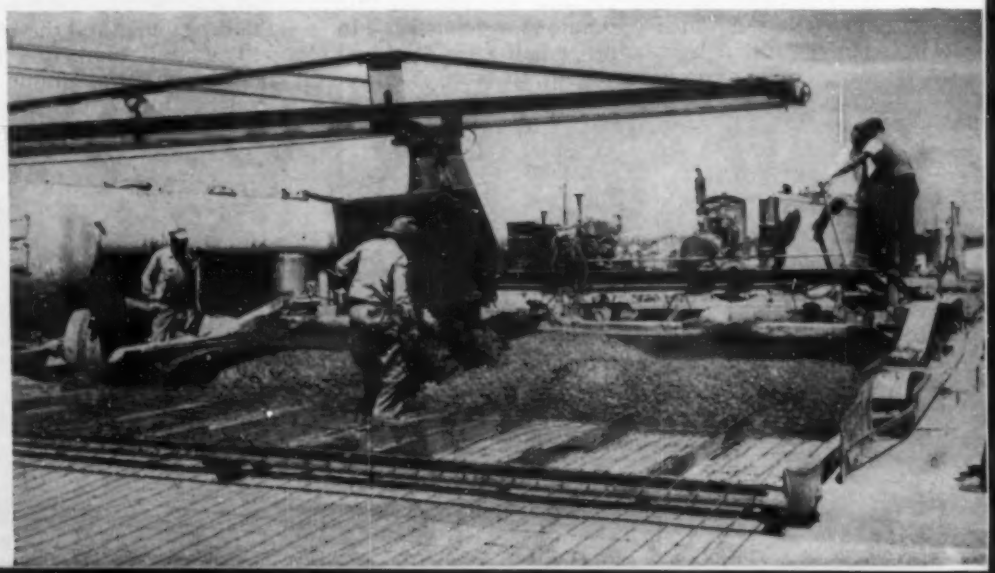
Expanding soils, however, had caused some distortion to sections of the old concrete roadway, laid in 1951. The Colorado department of highways and the U.S. Bureau of Public Roads, following the report of a special committee, agreed on special provisions in the project calling for four test sections to be incorporated in the contract.

One of these experimental sections was described as follows:

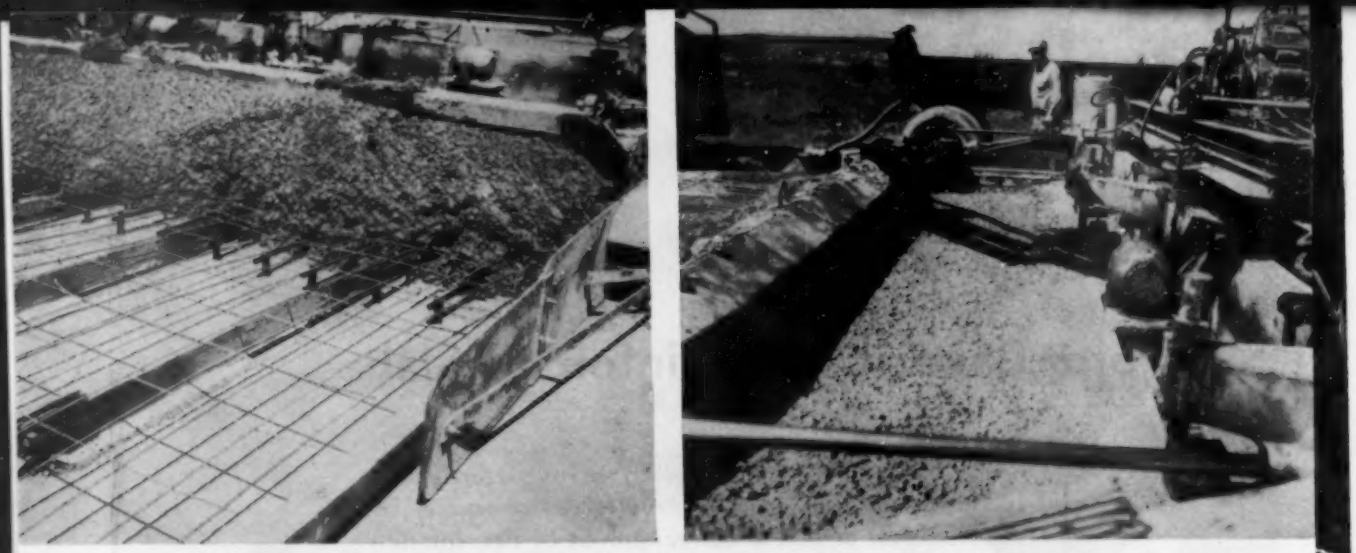
"One mile of concrete pavement with welded wire fabric reinforcement. One half-mile of this section to include style 6x12-1/4 fabric, with sawn joints spaced at 61′ 6″ centers as presently specified in the plans. The other half-mile is to include welded wire fabric reinforcement, style 6x12-00/4, with sawn joints spaced at 106′ 6″ centers. This spacing is based on 16-ft. long mats with 12-in. overlap and 3-in. unreinforced space to each joint."

The reinforcement was to be placed 2 in. from the top surface of the 8-in. concrete slab. The customary method would be to strike-off 6 in. depth of concrete between the forms, back up the paver, place the steel and lay the remainder using vibrators to insure full bond and homogeneity.

The contracting firm however had availed themselves of a permissive clause in the specifications,



● **Eight-inch wheel at corner of front member is shown. Concrete is being deposited over concrete which previously was pushed over the mesh by the screed. The side box girder is attached to the front member of the paver, but attachment is covered by concrete and does not appear in photo.**



● (Left) screed is pushing concrete over mesh and dowel pins. (Right) The screed is pushed forward in this photo. Before another pour is made, screed will be pulled back to permit new load to be poured on concrete which already covers wire mesh.

and had bid the job on the basis of using a slip-form paver. Considerable experience has been gained in the last few years with this method of paving in Colorado, and this method has been found satisfactory.

As soon as the contract was awarded everyone concerned began wondering how the experimental sections were to be laid with the slip-form—which can't back up for a second layer of concrete after the reinforcing steel has been placed.

Finding a solution was strictly up to the contractors, under a paragraph in the department's standard specifications, which read:

"The fabric shall be placed to depth and with lap as per details shown on plans. The method of holding the fabric in correct position during placement of concrete is to be developed by the contractor. Any method that places the wire mesh in correct position, as per plan details, in the completed, accepted work may be used."

Work on the overall contract started on July 31, 1957. It was halted on November 12 because of winter conditions and resumed on April 14 this year.

In short order the three other test sections had been laid: one mile of typical section, one-half mile test section of 10-in. thickness of concrete on 4-in. cement treated base, and one-half mile of experimental section consisting of 8-in. concrete paving on a 20-in. cement treated base.

The 4-in. cement treated base was laid for the reinforced concrete test section—and the contractors then brought forth a special gadget to be attached to the front of the slip-form paver to handle the wire mesh. This "sled" was manufactured locally to the contractor's own specifications.

● Structurally the "sled" is fashioned into a large "U". The outside members are 6-in. steel box girders. The open ends are attached to the forward arms of the paver by a 1-in. bolt and are on a ball-and-socket joint. The front end, welded to the box girders, consists of a 6-in. I-beam. Eight-inch wheels are attached under the forward corners, and two 6-in. wheels are placed under the center of the I-beam to facilitate the sled's forward movement.

A 3-in. pipe is placed across the full length of the top of the I-beam, and a 1-in. pipe was added later to aid in the easy movement of the wire mesh.

Running laterally between the box girders, and attached to the I-beam in front by hinged joints, are eight 10-ft. runners. These are of 6"x1/4" steel, set upright, with a width of 3/4 in. on the bottom. Runners are simply dragged along as the extending arms of the paver push the sled forward. The runners are spaced at intervals, left to right, of 34", 36", 36", 21", 30", 21", 36" and 36", with 34" between the last runner and the box girder.

The usual number of "bugs" developed as operations began. It was found that the front beam had a tendency to dig into the subgrade as it pulled the runners, and it was necessary to raise the beam.

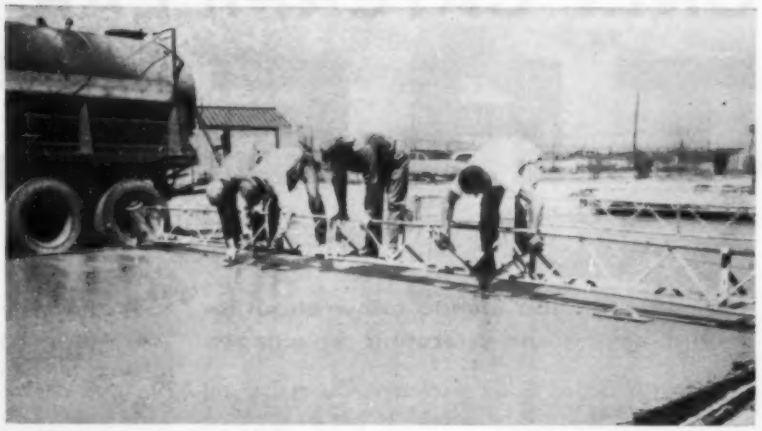
● Planer and roller are shown preparing subbase ahead of paving operation.

After this had been accomplished, it was discovered that the runners themselves were digging near the front, and 4-in. square steel plates were attached to the runner bottoms about 2 ft. from the front beam.

Some trouble was caused by the "sleds" pushing the dowel bars out of place, and dowels had to be straightened before going ahead. A better method still has to be devised for placing the load transfer bars at the sawed joints. When the front member of the sled aproached the dowel bars, timbers were placed ahead of the 8-in. wheels at the corners of the front member to lift the member over the dowel bars as the sled was pushed forward.

The forward motion of the sleds at first caused the wire mesh to move and break the tie-wires at the overlaps. Hooks were made with the three end wires of each panel of wire mesh, and these were used to link the sections of mesh together. The hooks held satisfactorily, but when starting at a joint the same slipping resulted at each joint. To remedy this, the mesh was made continuous and the wire was cut at the joints after the paver had gone over it. The cutting of the wire was done at the first bridge of the trailing forms.

It was then found that the dumping of concrete on the mesh caused the mesh to buckle, and a new method was worked out in which the screed of the paver pushed concrete onto the mat. The screed was pulled back and the pour then was dumped on this concrete, which held the mat in place with support from the bottom.



● **On the first bridge behind paver, two men are cutting wire mesh at joint which later will be sawed. Two finishers are on bridge beside cutters.**

Accuracy of placement of the reinforcing steel was determined by cutting trenches across the width of the concrete at a point immediately behind the paver. Careful measurements showed that the widest variation of the light mat was from 1¾ to 3½ in. from the surface. This overall average was 2.3 in.

● Trenches were not dug to determine the placement of the heavy mesh, but the position was ascertained with a straight hoe. Variations did not exceed ½ in. either way from the 2 in. depth specified.

The contractors placed an average of 2,000 ft. of 8″ x 24″ slab per day with non-reinforced concrete, and an average of 1,650 ft. per day, with no shut-down and working a 10-hour day, where reinforcement was required. Ten additional men were used to haul, spread and tie the wire mesh. Paul R. Morley, the department's resident engineer, and the contractors agreed that if the work had continued the speed of progress soon would have equaled that maintained by the paver for non-reinforced concrete.

"After the initial difficulties inherent in almost any mechanical equipment had been worked out, the combination of the sled and the slip-form paver turned out a highly creditable job, which I have approved," Morley reported. After giving the job special attention, the writer concurs in his opinion.

● **Placing center tie bars to hold parallel mats together. Twin 6-in. wheels are shown beneath middle of front member. Runners are shown with swivel joints which attach runners to front member of "sled." Both the 3-in. and 1-in. pipe across front member, also are shown.**

● **Front member of "sled" is being raised over dowel bar assembly, glimpsed just under, by timbers which lift 8-in. wheel at corner of "sled". Similar timbers are under wheel at other corner of front member.**

ONLY CATERPILLAR GIVES YOU THE OIL

Here is what you should know about its money-saving and operating advantages

How much better is the exclusive Caterpillar oil clutch than the ordinary clutch? It can be summed up in this short statement:

When the Caterpillar oil clutch is ready for *adjustment*, the ordinary clutch is ready for *replacement*. Experience in the field proves it.

In the years since 1954, when Caterpillar introduced this remarkable advance in earthmover power trains, owners all over the country have reported thousands of hours of oil clutch operation free of adjustment or repair.

Typical of these reports is this one from Myron Omernik, land improvement contractor of Custer, Wis.: "Our D7 has operated 5,100 hours without any oil clutch repairs or adjustment."

This performance record means two clear-cut money-saving advantages:

1. Virtual elimination of down time caused by clutch failure.

2. Greatly reduced repair costs.

But in addition to its economy features, the oil clutch also provides superior operation. Here is why:

1. A hydraulic booster on the D9 and D8, operated by clutch oil pump pressure, takes the effort out of clutch operation but retains clutch "feel."

2. Clutch "fade" because of overheating is practically eliminated. The oil in which the clutch parts run is pumped directly from the crankcase. This means the clutch temperature never rises above engine temperature.

3. A clutch brake helps match clutch and transmission speeds—making shifting easier.

Here, in brief, is how the oil clutch works:

Three metallic-faced plates are separated by oil films at all times except for the last revolution or two as the clutch is engaged. Oil enters the inner diameters of the clutch plates and circulates between them by means of grooves in the clutch facings, carrying away heat and reducing wear. All clutch parts are constantly running in oil.

The exclusive Caterpillar oil clutch is not an "extra"—it is *standard equipment* on the D9, D8, D7 and D6 Tractors, all Traxcavators, on the No. 12 Motor Grader and on the MD6 and MD7 Pipelayers. Yet it is an "extra" in *value* that is unmatched in the industry.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

IMPORTANT OIL CLUTCH FEATURES

Independent oil pump assures positive lubrication and cooling for clutch plates, bearings and other vital moving parts.

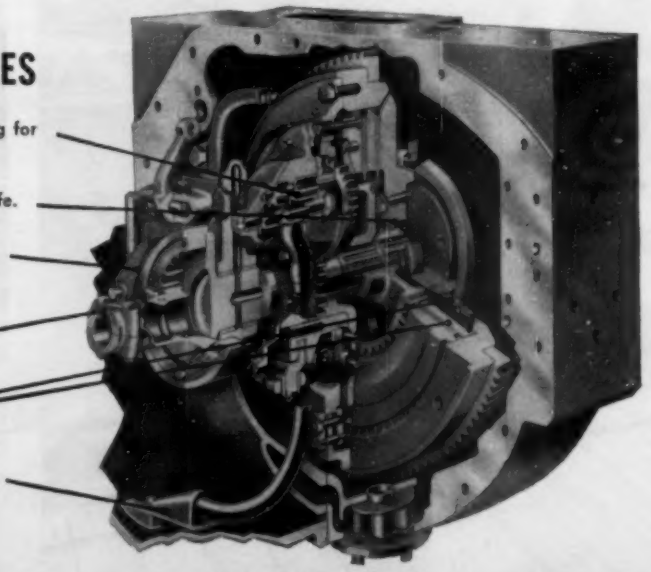
Heavy-duty bearings have extra capacity for long service life.

Clutch brake helps match clutch and transmission speeds—makes shifting easier.

Removable coupling allows clutch to be removed without disturbing engine or transmission.

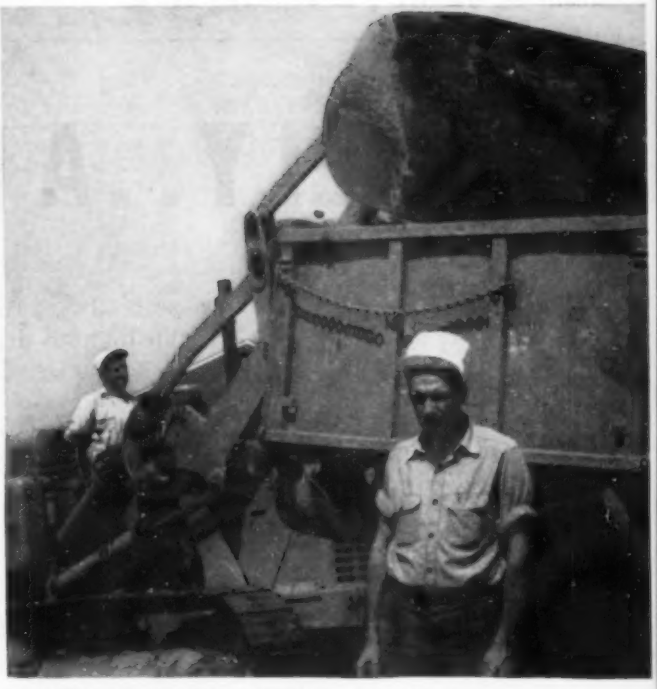
Double clutch plates are metallic-faced for heavy-duty torque transmission.

Intake screens protect the oil pump from foreign material.



CLUTCH

CAT D9 TRACTOR: "We have operated this Cat D9 Tractor for 4,000 hours in the toughest kind of work without any repairs to the oil clutch," says Frank Hill of the Silva & Hill Construction Co., Los Angeles, California. "I just wouldn't consider buying a tractor without it now."



CAT NO. 955 TRAXCAVATOR: "In over 4,000 hours on our two hard-working No. 955 Traxcavators, we have made only one simple adjustment on an oil clutch and that took only about a half hour. It's much simpler than the old friction-type clutch," says M. J. Lutz of Bethel Park, Pennsylvania.

OWNERS REPORT TROUBLE-FREE OPERATION

CAT NO. 12 MOTOR GRADER: "Our No. 12 is starting its third season without interruption due to clutch trouble." With only one clutch adjustment in over 2,000 hours, Francis Bloomer, President of the John F. Bloomer Co., Appleton, Wisconsin, says, "We like the No. 12 with the oil clutch." This company, with 35 years of road construction work, owns a fleet of Cat-built equipment consisting of No. 12s, D9, D8s, DW21s.

CATERPILLAR

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LEADER IN EARTHMOVING RESEARCH

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After two years

FINALLY . . A ROAD BUILDING

Two years after passage of the 1956 Federal-Aid Highway Act, state highway departments have begun to achieve the big contract-letting schedules the industry has been waiting for.

An exclusive *Roads and Streets* survey shows states planning 50% boost in 1958 contract awards to move road building volume onto a new high plateau.

Special report by HAROLD J. McKEEVER, Editor-in-Chief of *Roads and Streets*, and DUANE L. CRONK, Director, Highway Information Services, Washington, D. C.

WHEN CONGRESS VOTED the expanded highway program in July of 1956, many industry people looked for a sudden big upsurge in road work. This didn't occur quite as they hoped. But a steady upward swing has taken place in contract expenditures. And—*new job* awards are zooming. A *Roads and Streets* survey reveals that the state highway departments plan 50% higher awards than last year.

Here is the "big bulge" that the contractors and industry suppliers have awaited since 1956. State highway departments' award totals (federal and non-federal) for calendar 1958 were conservatively estimated at $3.6 billion earlier this year. This is being boosted upward further by the placement of the $600 million in emergency ABC funds, which must be awarded by next December.

The state departments at press time put their calendar year's award totals at $4.6 billion in response to an explicit questionnaire from *Roads and Streets*. If this optimisim is realized, it will mean a 50% rise in a single calendar year over what the states reported in 1957. This may well throw the year's total high contract awards by all agencies and government levels to $5.2 billion or possibly more.

The states are going ahead at varying paces; *Figure 1* table reveals the great differences in the awarding step-up. A few states expect to more than double—even triple—their dollar letting volume. Others, although already out front, are going on to even higher ground.

Some states have more catching-up to do than others in the race to invest the federal gold. *Figure 3* shows their status as of May 1. Ohio was in first place with contract awards already made for 84% of the then-available federal funds. West Virginia and Delaware were at the bottom, with only 26% and 24% showings. The other 45 states were stretched out between.

The reasons for the lack of uniformity are many and diverse. For example, Ohio had gotten into high gear with the help of bond funds, and had pioneered in aerial location, photogrammetry and other manpower-stretching techniques. The highway staff was already in high gear. When the Interstate money flooded in, consultants were given big chunks of work to keep the load moving.

SOME STATES DOUBLING AWARDS

How the States are Stepping up Road Contract Awards

Big Rise in Progress for Last Half of 1958

Here are the answers to Roads and Streets' recent questions to state highway officials: "How much work did you award to contractors last year?" ..."How much will you award this year?"

STATE	1957 CALENDAR YEAR	1958 FIRST HALF (EST.)	1958 CALENDAR YEAR (EST.)
Alabama	$ 38,033,215	$ 14,209,401	$ 40,000,000
Arizona	27,627,000	16,990,000	30,000,000
Arkansas	20,327,072	21,800,000	54,000,000
California	232,476,000	119,730,000	270,000,000
Colorado	48,940,000	15,800,000	50,000,000
Connecticut	83,754,789	13,338,000	90,000,000
Delaware	14,080,000	7,000,000	18,000,000
Florida	93,300,000	51,660,767	120,660,767
Georgia	107,162,026	45,521,000	125,000,000
Idaho	17,059,516	12,500,000	30,000,000
Illinois	137,600,000	123,500,000	234,000,000
Indiana	29,386,934	37,625,000	90,000,000
Iowa	93,551,000	30,000,000	136,100,000
Kansas	66,188,539	40,000,000	84,000,000
Kentucky	43,615,000	25,847,759	100,000,000
Louisiana	70,000,000	58,000,000	105,000,000
Maine	15,578,972	15,195,754	33,000,000
Maryland	35,701,134	20,394,000	55,000,000
Massachusetts	68,000,000	35,000,000	154,000,000
Michigan	131,000,000	58,600,000	131,000,000
Minnesota	35,000,000	31,000,000	83,000,000
Mississippi	46,786,705	17,466,636	56,520,000
Missouri	76,514,745	67,570,876	80,500,000
Montana	23,000,000	14,604,942	55,000,000
Nebraska	34,513,342	25,312,030	55,000,000
Nevada	15,160,000	10,650,000	30,000,000
New Hampshire	18,071,168	12,500,000	37,918,000
New Jersey	37,644,000	22,190,000	40,000,000
New Mexico	40,013,783	16,551,567	43,500,000
New York	276,800,000	146,000,000	350,000,000
North Carolina	68,500,000	37,400,000	80,000,000
North Dakota	29,393,000	25,500,000	48,500,000
Ohio	193,000,000	124,000,000	280,000,000
Oklahoma	62,886,000	50,000,000	100,000,000
Oregon	36,500,000	22,500,000	55,000,000
Pennsylvania	173,448,002	97,288,076	250,000,000
Rhode Island	11,595,000	12,466,662	25,000,000
South Carolina	34,700,000	44,000,000	115,000,000
South Dakota	26,801,959	14,590,000	41,000,000
Tennessee	51,045,487	33,890,435	112,000,000
Texas	223,600,000	136,217,220	285,000,000
Utah	20,000,000	16,000,000	40,000,000
Vermont	10,460,000	14,000,000	32,000,000
Virginia	62,875,643	42,478,504	147,478,504
Washington	69,438,900	38,500,000	85,000,000
West Virginia	22,325,463	8,843,000	27,000,000
Wisconsin	54,000,000	21,005,000	90,000,000
Wyoming	33,443,750	17,000,000	43,000,000
District of Columbia	12,651,000	10,250,000	33,275,000
TOTALS	$3,173,549,144	$1,892,486,629	$4,670,452,271

Figure 1

BOOM

California's excellent showing stems from having an A-1 department with ample personnel, long-range planning, a good leadership generally, and the fact that the state's work has long been geared to interstate-type jobs.

The straggling states expect to make notable progress this year. For example, West Virginia says its awards will be up 21%, Delaware's up 28%, Idaho's up 82%, and South Dakota's up 53%.

In the lower-echelon states, the lag is due to any or all of the weaknesses that have been repeatedly publicized: lack of legislative foresight and hence matching funds, understaffed highway departments; and rural domination in the face of urbanization, to name a few. It is ironical that a few states are still having difficulty matching funds, even when Uncle puts up from 50 to 90 cents on the dollar.

Actually some states had not awarded all their 1957 federal allotments, while several were almost through their 1959 fiscal funds and clamoring for 1960 funds a year early.

● *The Build-Up:* It has taken time for this year's promised crest in contract awards to build up. The problems faced by the state highway departments two years ago were spelled out in the "Blueprint for an Expanded Highway Program," published in *Roads and Streets* in June, 1956, on the eve of the program's passage. These

The Progress Picture, in a Nutshell

- The long-awaited "big-bulge" is happening—in the form of an upsurge of new road contract awards this year. State highway contract lettings for calendar 1958 promise to reach $4.6 billion—50% over 1957, and largest one-year rise in highway history.
- Contractor payments for road work will also reach new record high in calendar 1958—up 13% or more over 1957.
- The present construction rise will continue through the next two years, with a further minimum 26% increase by 1960 assured by the big bulge in job starts. "Then what?", Congress and state legislatures are being asked.
- These are national figures. The progress in individual states is far from uniform. Some are out ahead, some still straggling.

Figure 2—Forecast of Highway Construction Expenditures

(Calendar Years; Millions of Dollars)

	1956	1957	1958	1959	1960
Total Capital Outlays	$4,940	$5,645	$6,500	$7,500	$8,100
Less R/W and P/E	450	800	1,050	1,250	1,100
	$4,490	$4,845	$5,450	$6,250	$7,000
Construction Only					
Federal Aid Program	1,300	1,920	2,500	3,650	4,400
Other State Programs	900	1,000	1,375	1,275	1,300
Toll Authorities	1 090	875	475	175	100
Cities and Counties	900	950	1,000	1,050	1,100
Federal	100	100	100	100	100
Total Construction Only	4,490	4,845	5,450	6,250	7,000
Less Force Account	400	400	400	400	400
Less On-Site Engrg. (4%)	190	200	200	250	300
Net Contract Construction	$3,900	$4,245	$4,850	$5,600	$6,300

This year's big spurt in contract awards will be reflected over a number of years to come in payments to contractors for work completed, which is roughly synonymous to "expenditures." An intensive analysis of all the factors governing expenditures by all levels of government and the toll authorities yields the forecast figures above. By stripping away such non-construction items as right-of-way and preliminary engineering, the net construction volume has been determined; and by further eliminating force account and on-site engineering, the *net* contract construction volume is isolated. These are the figures which are meaningful to contractors and the suppliers who need reliable market volume information.

(From an independent analysis of the highway industry market, developed exclusively for Roads and Streets by Highway Iinformation Services, Washington, D. C.)

problems—of finding and training new engineers and technicians, developing locations and designs, and acquiring rights-of-way on a suddenly expanded scale—have proven as formidable as anticipated. But the difficulties are getting under control in most states.

● *Effect on Future Expenditures:* The 1958 boom in highway contracts will be reflected in higher subsequent "expenditures" or payments for work completed for a number of years to come. As the big volume of projects started this year are brought to completion, these payments to contractors will increase substantially.

This year will see a healthy 13% increase in total net contract construction expenditures—$4,850 million by all levels of government. *(Figure 2.)* Beyond that, 1959 will see another jump to $5,600 million and in 1960 this figure will rise again to $6,300. Thus the spurt in contract awards this year will push payments to contractors to new levels, each successively higher than the preceding year by $600 million or more.

With right-of-way and other costs thrown in, the total annual capital outlay for highways at all government levels will reach $6,500, $7,500 and $8,000 respectively for 1958, 1959 and 1960. *Figure 4* presents this picture in graphic form. Right-of-way costs have increased due chiefly to new Interstate locations. *(Figures 3 and 4.)* Right-of-way activity began expanding in 1954 in anticipation of the 1956 act. Then in 1957 this expenditure doubled in a single year. It is headed for $1,050 million in calendar 1958, a peak of $1,250 million next year, then a slight drop-off in 1960. These figures are based on present prices; many observers are braced for higher. Despite high land costs the proportion of Interstate funds going into construction is on the increase however.

Critics of our progress might note that the rise in the capital outlay rate from 1956 through 1960 is 64% —a good showing for any major industry. This is on top of a 230% gain in the 1947-1956 decade. *(Figure 5).* This apparent growth is subject to correction for dollar devaluation; the BPR's price index rose 45% in the period.

The Federal share during the 1956-1960 interval is rising from 27% to 63%, due to the Interstate (90%) projects.

● *The Interstate Program.* Principal focal-point of public interest, of course, has been the Interstate program, which has had adverse publicity over its slow and irregular star. The Interstate effort today is rolling—well up to schedule on the average, but still with great variation from state to state, as will be discussed.

The two-year Interstate accomplishment up to July 1 (official BPR figures) was:

- 1,627 miles of projects completed ($408 million).
- 2,017 miles under construction $1,441 million).
- 2,000 miles (est.) preliminary engineering and right-of-way authorized ($1,480 million).
- 1,965 miles programmed only ($1,091 million).

The foregoing figures include 3,236 major structures completed or under construction, another 889 awarded or advertised, and 1,697 scheduled.

Interstate job awards are starting to be big business. First quarter 1958 awards were $264 million. Second quarter awards were $409 million. The award volume is climbing this summer and monthly completion mileages will grow as the season advances.

The present outlook for the Interstate program is in sharp contrast with the uncertainty that would have prevailed, had Congress not temporarily lifted the Byrd amendment from the 1956 act. The 1958 act besides voting increased funds *(Figure 6)* also set this clause aside for two years. This is the rider which limited Interstate expenditures in any year to the sum paid into the Highway Trust Fund that year from automotive excise taxes. *Figure 7* reveals (dotted line) how the Interstate funds would have dried up just as the program reached high gear. The upper solid line shows the steady rate of funds now assured for the biennium ahead.

How the full funds assure a continued growth in road expenditures is again shown in *Figure 8* (upper line). Further, this graph eloquently paints the importance of banishing the Byrd amendment permanently, or finding substitute financing.

The relative dollar size of the Interstate, ABC, emergency and public-domain road programs, including state matching is shown in *Figure 9*.

● *Lead Time.* The two to three year or longer "lead time" often required to bring Interstate road projects to the award stage is pictured in *Figure 10*. This also visualizes how work has expanded at all stages. Note that a small start had been made prior to July, 1956; this was made possible by the $25 million annual seedling allotments for Interstate work in 1954 and 1955. This early start gave some states a chance to begin some very ambitious projects, now well along or completed.

ABC projects in general require less lead time, visualized in *Figure 11*. These projects move faster through the various stages because the jobs are simpler and seldom involve complete relocation.

When the money for all projects was in the federal pipeline on April 1 is pictured in *Figure 14*.

The state highway departments since July of 1956, when the 90% Interstate money became available, have given high priority to federal aid projects, while state projects without federal aid have continued at about $600 million annually.

● *Progress on ABC Systems:* The so-called ABC networks (primary, secondary, urban) during the past 23 months have seen the following substantial progress:

How the States are Strung Out

Percentage of available federal-aid highway funds awarded to contract by the state highway departments, as of May 1, 1958. Does not include the $3.4 billion fiscal 1960 f. a. funds available to the states late this summer.

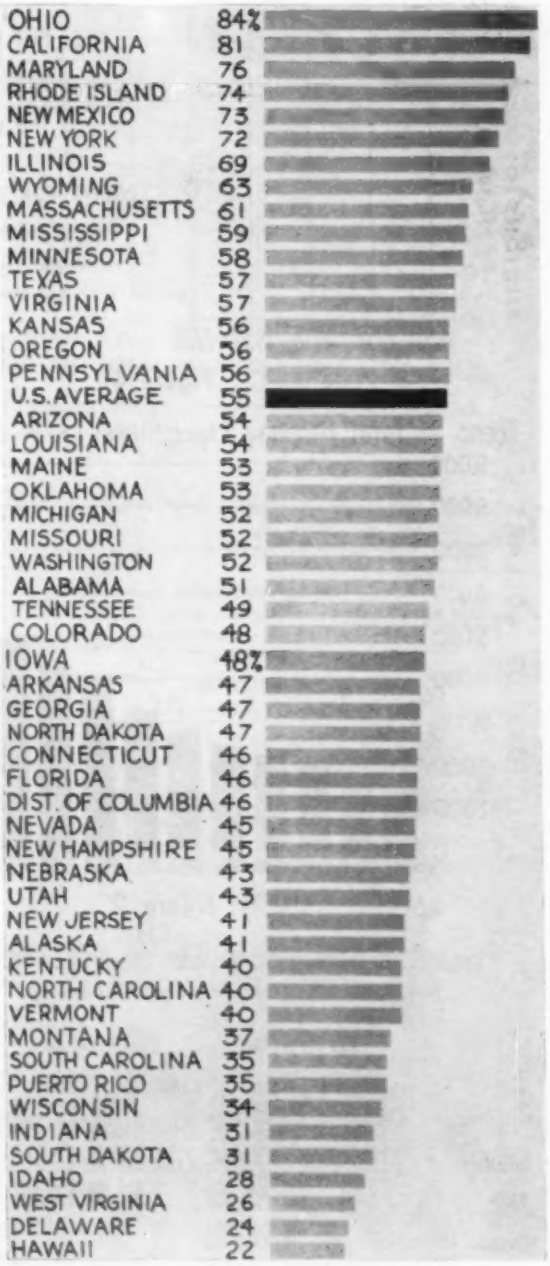


Figure 3

Data for graphs and tables compiled for ROADS and STREETS by Highway Information Services, Washington 5, D. C.

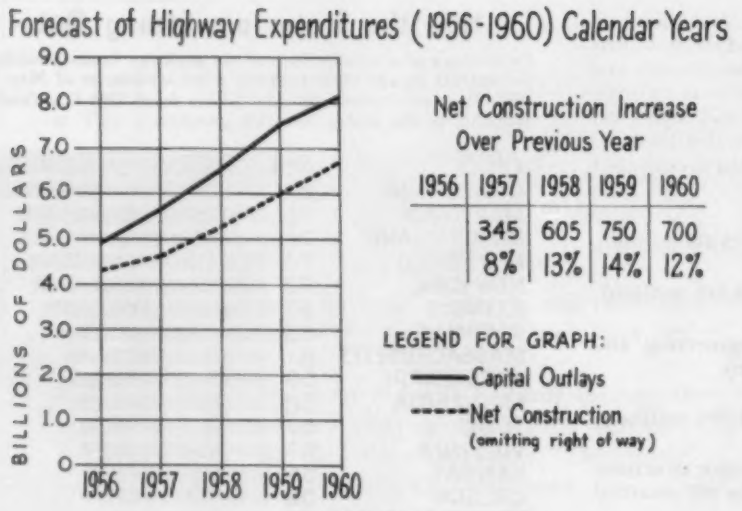


Figure 4

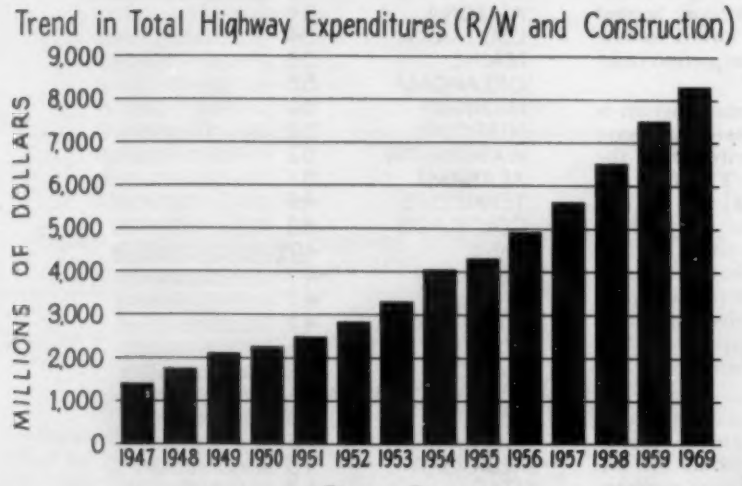


Figure 5

Federal Aid Authorizations Under the 1956 and 1958 Acts
(IN MILLIONS OF DOLLARS)

	1959 Fiscal Year					1960 Fiscal Year					1961 Fiscal Year				
For	under '56 act	under '58 act	F/A total	State match-ing	Total	under '56 act	under '58 act	F/A total	State match-ing	Total	under '56 act	under '58 act	F/A total	State match-ing	Total
Interstate	2,200	200	2,400	240	2,640	2,200	300	2,500	275	2,775	2,200	300	2,500	275	2,775
ABC	875		875	875	1,750		900	900	900	1,800		925	925	925	1,850
Emergency ABC		400	400	200	600										
Public Domain	103	11	114		114		112	112		112		112	112		112
Totals	3,178	611	3,789	1,315	5,104	2,200	1,312	3,512	1,175	4,687	2,200	1,337	3,537	1,200	4,737

	1959	1960-1961	Total	with Matching
Total new Federal aid authorized in 1958 act	611	2,649	3,260	5,373
Total Federal aid authorized in 1956 act	3,178	4,400	7,578	9,155
Totals	3,789	7,049	10,838	14,528

Figure 6

• 40,493 miles of construction completed at a cost of $2.4 billion.

• 22,680 miles of jobs now under construction at a cost of $2.2 billion.

• 3,231 miles advertised for bids, representing a cost of $488 million.

The $400 million federal emergency anti-recession funds (plus $200 million matching) voted in April must be spent entirely on ABC projects. The impetus of this quick money is already being felt, as noted elsewhere in this issue.

● *Toll Roads:* What of the toll roads? This year and next will see the virtual end of an Era. *(Figure 13).* The $1.06-billion peak of toll road construction has passed. The outlook is for spending about $100 million annually for toll tunnels, bridges and other special facilities.

One-half of the $475 million toll road spending this year is for finishing the 187-mile Illinois Tollway.

● *What's Ahead?* Financing still looms as the highway industry's No. 1 concern.

First, legislatures must act in nearly all states. Their tasks range all the way from setting up basic need studies and streamlining the highway departments, to finding matching funds for kick along work outside federal aid. How the state revenues are split among cities, counties and state work will require fresh review. Bond issues will be needed. Diversion, still continuing, must be stemmed. All this takes lead time of its own, and action now will largely determine how well the highway program in any state can be maintained at the 1960 plateau during the interim beyond.

Second, Congress has further work to do. The 1958 act is a stopgap. Unless more funds are found—and unless the financing of the Interstate program particularly is put on a long-range basis—the road building agencies, contractors and supply industry cannot plan for fullest efficiency. The Byrd amendment must be banished. And, important new billions must be found to meet the rising cost of completing the Interstate network on time.

Congress must wrestle with many other aspects of federal policy. The new allocation formular based on need, which will go into effect beginning with fiscal 1960, faces a battle. Huge sums are at stake—money taken from some states and given to others. Then there is the question of whether to nationalize the toll roads, take over their bonds and make them free.

In the state highway departments, the shortage of trained

highway engineers and technicians, although slightly diminished, is still with us. Now that their work load is so huge, the departments must be set up more solidly by discerning legislatures. A climate muts be established for maintaining leadership and applying the engineering technology that can bring work to the contract stage much sooner.

There is concern over the recent shrinkage in non-federal-aid projects. State awards for such jobs for the first four months of 1958, as part of the generally slow start, were 22% off from the comparable 1957 period. They are still lagging. This suggests that the effect of $400 million emergency funds is being partially nullified, by simply throwing more load on federal funds.

Good roads organizations in the states must be vigilant in seeing that the over-all highway transportation needs are being filled on a balanced basis, and that state, city and county fund sources aren't drying up.

Meanwhile, simply this recap: We are on new high ground, the national program is (on the average) on schedule. We have two more years of assured expansion, then legislative action must provide funds for continuing the long range job.

$400 Million Fund Gets Fast Action

HALF of the $400 million apportionment of "emergency highway funds" which Congress authorized in April was programmed by

(Continued on page 66)

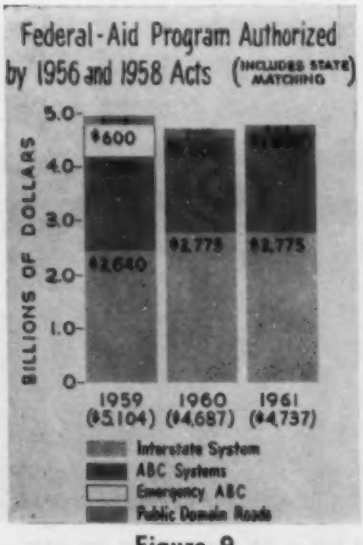
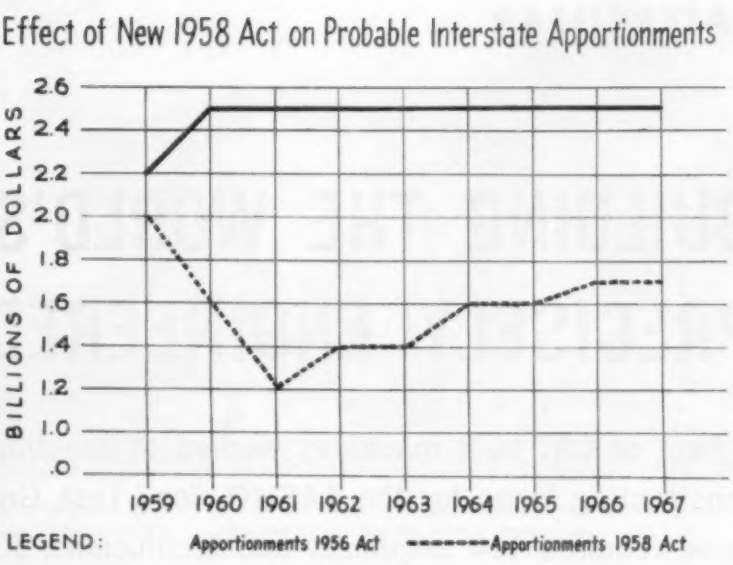


Figure 9



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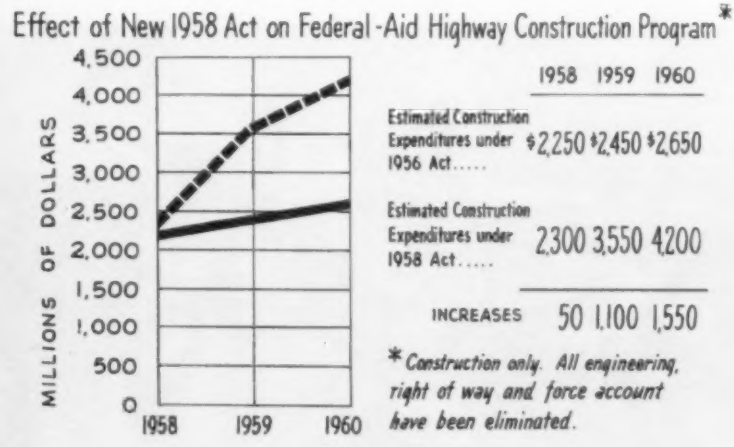

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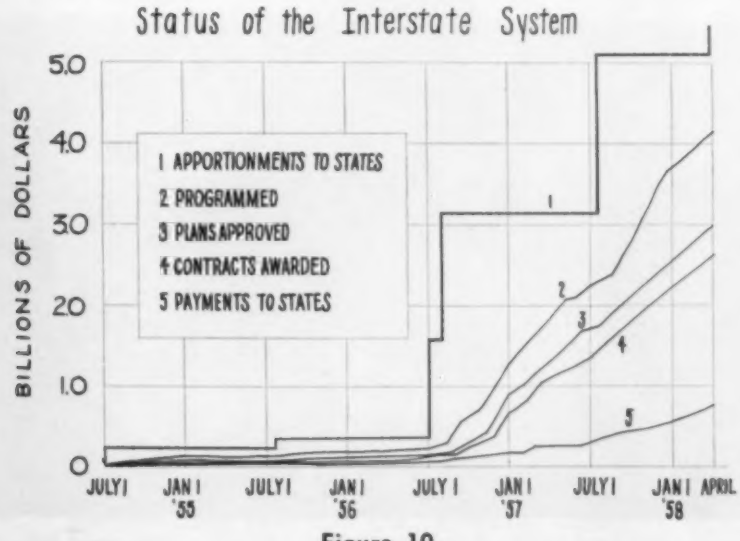

Figure 10

BUILDING THE WORLD'S MOST PRECISELY ENGINEERED HIGHWAYS

A fleet of CAT-built machines worked to exacting standards constructing loops for the AASHO Road Test. Grading operations alone required 114 engineers and technicians, 50,000 tests.

Caterpillar DW21s and DW20s with Scrapers helped move 1¼ million cu. yd. of earth in 3 months. At peak, more than 25,000 cu. yd. were moved daily. About half of this was placed in the upper three feet of embankment under strict controls for uniformity.

Caterpillar D8 Tractors pulled pneumatic rollers for precisely measured compaction. Gross weight of the unit is 15 tons; weight per square inch of tire—425 pounds. Seven to eight passes were required to provide the density demanded.

In La Salle County, Ill., six highway test loops make up what is probably the most rigidly engineered and supervised highway construction job in history.

It had to be. For these roads are the site of the largest, most comprehensive highway research project ever undertaken. Known as the AASHO Road Test, its prime objective is "to study the behavior of pavements of known thickness under dynamic loads of known magnitude and frequency."

Results of the $22 million test will be reported to Congress and probably will affect highway design and construction for years to come.

As is standard on any exacting, important highway construction job, Cat DW21 and DW20 wheel Tractors, D8 track-type Tractors and No. 12 Motor Graders were put to work by S. J. Groves and Sons Co. and Arcole-Midwest Corp. These machines, with their high availability record and minimum maintenance requirements, helped move 1¼ million cu. yd. of earth in 3 months under controls more strict than ever before attempted in large-scale highway construction. Grading operations were completed for four main loops of 6,600 feet each of four-lane divided roadway, a 4,400-foot loop, and a 2,200-foot loop. Total distance around each of the main loops is 3.1 miles.

For test traffic, trucks with axle loads ranging from 2,000 pounds on a single axle to 48,000 pounds on a tandem axle are scheduled to run 18 hours a day, six days a week, for two years over the five largest loops.

As the big yellow machines rolled on the job, thousands of tests were conducted continuously to assure precise uniformity of the earth in embankments. Compacted density was controlled between 95 and 100 per cent of standard maximum, and moisture content was controlled between plus or minus 2 per cent of optimum. During grading operations, 50,000 tests were performed and 114 engineers and technicians were at work both in construction control and in the materials laboratory.

As is usual in jobs where there is no margin for error, Caterpillar-built machines were at work.

No. 12 Motor Graders, workhorses of highway construction, maintained haul roads and graded to fine tolerances. Grading was carried out in blocks 500 to 800 feet long.

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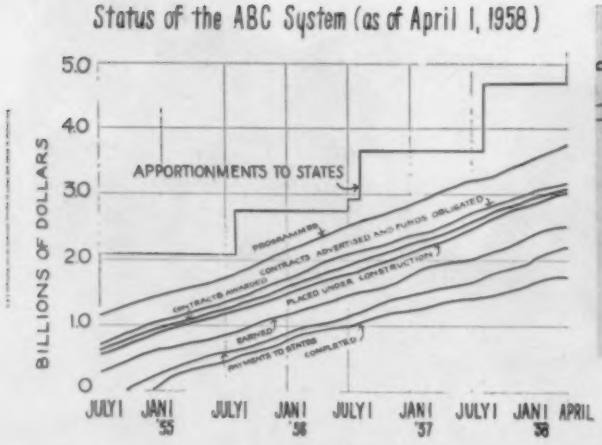

Figure 11

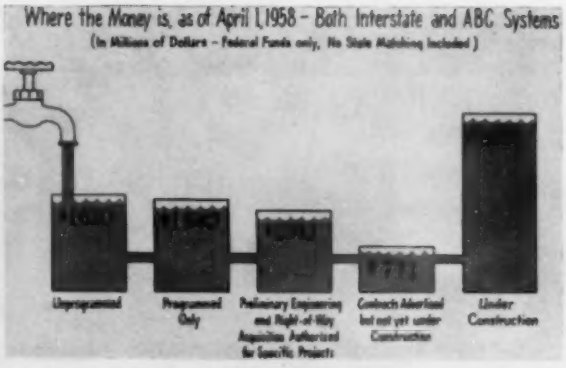
Where the Money is, as of April 1,1958 - Both Interstate and ABC Systems
(In Millions of Dollars - Federal Funds only, No State Matching Included)
Unprogrammed
Preprogrammed Only
Preliminary Engineering and Right-of-Way Acquisition Authorized for Specific Projects
Contracts Advertised but not yet under Construction
Under Construction

Figure 12

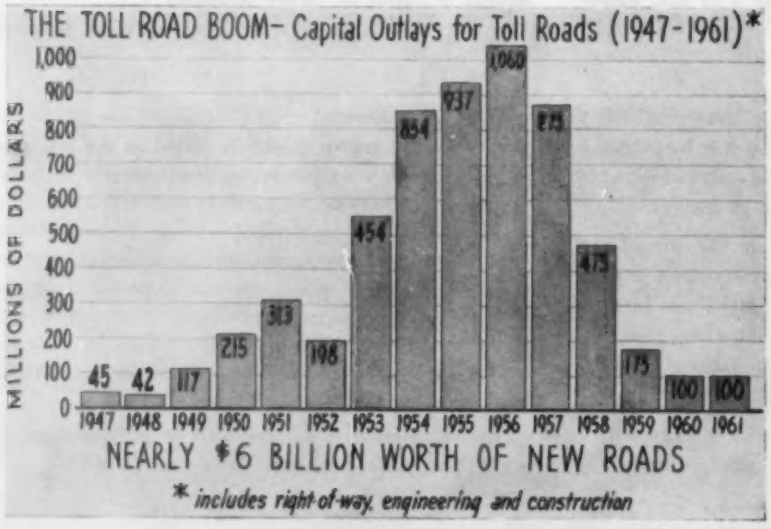

Figure 13

$400 MILLION FUND

(Continued from page 63)

July 1, the Bureau of Public Roads reported. State highway departments have been quick to earmark the grants for specific grading, drainage, surfacing, and general reconstruction projects.

Under the legislation, the state must move fast. Projects utilizing all of the $400 million must be let by December 1 this year, and projects must be of a type that can be completed by December 1 of next year.

Contractors are watching the program closely because the $600 million total ($400 million federal-aid plus $200 million state matching) represents a pure construction market. None of the money may be spent for right-of-way or preliminary engineering.

Projects worth over $300 million have already cleared the programming stage. Some states programmed their entire allotment by early July, and this list is growing almost daily.

The favorable matching formula, ⅔ federal, ⅓ state, with $115 million lendable to the states for matching, is enabling a number of states with matching problems to go ahead again and others to step up contract awarding.

The Bureau of Public Roads is cutting "red tape" to speed up awarding of contracts. Field offices have been given authority to approve projects. A state's entire program may be agreed upon, rather than project-by-project.

The federal money is to be used for *construction only*, not maintenance jobs. The Bureau is insisting on this literal interpretation of the law, an attitude which disturbs some states which would like to use the "windfall" funds to patch roads that went to pieces under this spring's unusually severe break-up season. Work under this program must definitely be of an "improvement" nature, the BPR claims, to qualify under the "construction" label Congress specified. However, "betterment" resurfacing is being permitted. The result is a rash of such projects this year.

Generally, the Southern states are programming grading projects and scheduling surfacing for later financing under the regular ABC program. Thus, the anti-recession program is actually stimulating a volume considerably greater than its own. Some mid-western states are using their shares for resurfacing, with a minimum of grading involved. And in other states, the range of projects is wide, both in character and size.

● *Take Ohio:* Here, a riffling of project approvals reveals projects ranging from a $1.8 million job of grading, drainage and surfacing to widen, strengthen and resurface an existing pavement, down to a $12,000 resurfacing proposal.

Some urban projects in Ohio are coming under the program. An example: grading, drainage and paving of a primary highway near patterson, for the first two lanes of a 4-lane project which will be completed later with regular ABC funds.

● *In Minnesota,* $2 million was quickly allotted to the 87 counties for secondary projects. The remaining $7.5 million was programmed for trunk route jobs. Here, 34% will go for grading and miscellaneous, 12% for gravel and stone bases, 19% for bituminous surfacing, 22% for concrete paving, and 13% for

bridge work. Almost all of the state's apportionment was awarded to two large lettings.

Minnesota was glad to see the emergency program come along, John H. Mullen, executive director of the Minnesota Good Roads, Inc., told *Roads and Streets*.

"The emergency appropriation came just at the right time. Minnesota had used up practically all of its previous federal-aid for primary roads."

Taken nationally, the $600 program, a one-shot deal, represents another shift in emphasis. Since the state's interstate work was launched two years ago, major emphasis has been on the *new construction*. The "emergency" program, however, with its time limitation, moves into priority position for a few months and in most states this will mean more work for contractors geared to handle the familiar *reconstruction* jobs, usually of a smaller size. It may prove a welcome boon to firms not yet prepared or willing to bid for the big Interstate projects but more accustomed to tackling widening, re-aligning and resurfacing jobs. Strung out through the summer, such work may be the salvation of such contractors.

In other states, as in Minnesota, which have gone far ahead with all other available federal-aid, the "anti-recession" program will mean an even greater volume of construction than previously predicted for 1958. Ohio was in this situation. There, the federal emergency funds will finance about half of a new statewide surfacing program, which will bring the total expended for this type of work to $35 million over the period of 12 or 15 months. (This compares with $7 million recently spent per year in Ohio for resurfacing.)

● *Missouri* is another example. Total construction there will hit $130 million during the next 12 months, compared to $100 million expended during fiscal 1958. The "emergency" program is producing about $12 million of this increase.

"The end result will be to let the 1958 planned construction program sooner than was expected, and to begin letting contracts for 1959 ahead of schedule," Maurice Martin, acting director of highways, reported.

● *Oklahoma* is typical of the states which had plans ready for prosecution under their regular ABC programs and could use them to put the "emergency" funds to work quickly. Almost all of the department's allotment was let to contract within a few weeks of the Congressional action, G. H. Bittle, chief engineer, reported.

Some highway observers in Washington are viewing the flurry of programming with tongue in cheek. They claim that most of the states are already producing plans at their peak rate; that the regular $925 million ABC program will be slighted to take advantage of the emergency monies.

● Both the B&K and the American Association of State Highway Officials declare that this will not occur. They point out that a number of states had reached the point where, had the 1958 Act not provided additional money, they would have had to reduce their engineering pace this year. E. A. Stromberg, chief of the BPR's Information Division, said:

"The states know that Congress wants this program to supplement, not substitute for, their regular federal-aid primary, urban and secondary programs. The ABC contract awards may fall off slightly but we're confident they'll come back up."

Norway Experience with Steel Pile Foundations

Laurits Bjerrum. Journal of the Boston Society of Civil Engineers; July, 1957 (715 Tremont St., Boston, Mass.).

This paper reviews 25 years of Norwegian experience in the use of steel piles for foundations. The condition of soft clay overlying a hard and often steeply inclined rock surface which is common in Norway creates a number of problems in the design and driving of point bearing piles to bedrock. Methods of pile driving which have been evolved to insure a satisfactory sealing of the pile point into rock are described in detail.

The problems of the buckling of piles under load and of the corrosion of steel piles in the ground are discussed in the light of recorded experience. Finally, the settlements of single piles and of buildings are discussed. The settlement of a successful single pile is found approximately equal to the elastic compression of the pile, whereas observations indicate that the settlements of buildings are two or four times this value.

The study of the development of steel piles in Norway is an illustrating example of how technical conquests are initiated by practical engineers through experiments—and very often daring experiments. The example demonstrates, moreover, that the daring pioneer work is only changed into a true development and a substantial progress provided it is succeeded by careful studies of the behavior of the finished structures.

In the case of foundations in Norway these factors—the daring experiments followed by careful studies of the finished buildings—are the main contribution to the existing tradition in foundation engineering.

Michigan Checking 9,300 Miles for Condition

A statewide check of existing pavements covering 9,300 miles of highway is in progress on Michigan's trunkline system. The purpose is to measure the ability of existing pavements to carry heavy traffic the year around. The survey is confined largely to the spring and fall seasons. A special 22-wheeled vehicle has been developed by the department for the work.

This activity is being financed through a $45,000 grant from the Michigan Trucking Association, The American Trucking Associations, and The Automobile Manufacturers' Association, with the work being done through the University of Michigan.

The first roads surveyed were those included in the 3,600 miles of "frost free" truck routes selected late in the winter by highway commissioner Mackie. Data for future road design are also being sought through this check-up.

The machine works through 16 small wheels in the front and rear, and recording wheels in the center, linked with sensitive instruments to measure and record the profile. Comparison of profiles during the spring months with those taken at other seasons will be made. Professor William Housel of the University of Michigan is directing the study.

● The California Highway Construction Cost Index for the Second Quarter 1958 continued downward; now stands at 231.0 (1940=100), 10.8 index points or 4.5 percent below the first quarter. It is the lowest point reached during the last two years and is 35.9 points (13.5 percent) below the same quarter in 1957.

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Why Accident Prevention Is Important To A General Contractor

(From "Safety News Letter," published by the Construction section of the National Safety Council)

By William G. Hawkins
Insurance Manager and Director of Safety
Winston Bros. Co., Minneapolis

Winston Bros. Company has always emphasized the importance of accident prevention, primarily from the standpoint of the human equation. We feel that the protection of life and limb of the individual is one of our prime responsibilities. In addition, accident prevention is also important from an economic standpoint, for a good safety program means not only a reduction in insurance costs, but it also means an efficient operating project.

We believe that too great an emphasis cannot be placed on the value of management interest, support and personal action in accident prevention. Management participation must be extended in the same way and to the same extent that is required for other problems of equal importance. It must be fully recognized that, in the beginning of a safety program or during the start of any new construction job, management must take at first an aggressive attitude in this work until the thought is instilled in everyone's mind that supervisors, foremen and workers alike are expected to give full cooperation to the plan. Accident prevention is closely related to the control of any other function; the causes of failure with regard to both are identical. The remedy for both (the enforcement of safe and efficient practice) is likewise identical. Accident prevention, therefore, requires no more and no less management and supervisory attention than any other problem of equal economic importance.

An effective accident prevention program is established and carried out on all Winston Bros. Company projects. The effectiveness of this accident prevention program is assured through the participation and cooperation of all management, supervision and employees, and the coordination of their efforts is accomplished by carrying out the following basic procedures:

A. Planning all work to minimize personal injury, property damage and loss of productive time.

B. Maintaining a system for promptly detecting and correcting unsafe practices and conditions.

C. Making available and enforcing the use of personal protective equipment and mechanical guards.

D. Maintaining an effective system of equipment and tool inspection and maintenance.

E. Investigating all accidents, determining cause, and taking the necessary corrective action.

F. Establishing an educational program to maintain interest and cooperation of all levels of employment.

Note: W. J. Rohan, president of Winston Bros., says: "Mr. Hawkins, as a member of our firm, is responsible for the direction of our safety program on a company-wide basis, and I back him up in this work 100% because successful accident prevention on all our jobs is very important to us as a general contractor."

Concrete Paving Awards

Awards of concrete pavement for the first five months of 1958, as reported by the Portland Cement Association, total 30.2 million square yards for highway projects, 14.9 million square yards for street and alleys, and 9.5 million square yards for airports.

Oil-Well Brine Reduces County's Maintenance

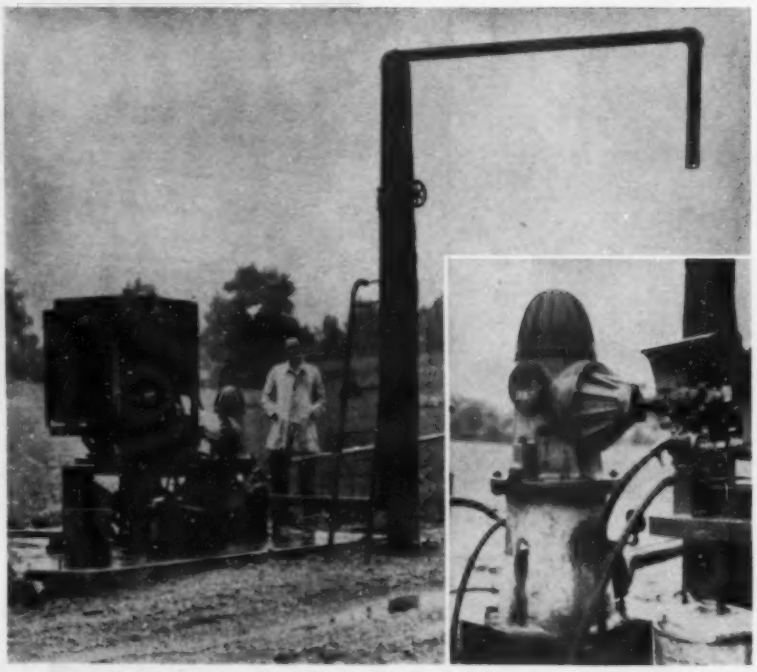
SALT brine pumped from an abandoned wildcat oil well permits the Jackson County (Mich.) road commission to maintain its gravel roads at approximately one-sixth of the previous cost. County road workers treat 800 miles of gravel highways with the brine at a cost that covered only 133 miles when the group bought calcium chloride for road treatment.

The commission purchased the rights to the abandoned well and discovered the brine contained about half calcium chloride and half sodium chloride, with a slight trace of magnesium chloride. The board uses the brine in 20-25 percent strength to stabilize gravel roads in the county. To date, 1¾ million gallons have been used. The county highways include 800 miles of gravel roads and 600 miles of blacktop and concrete roads. Population is 105,000.

The Jackson County commission previously bought flake calcium chloride for gravel road maintenance. The cost then was about $24 per ton of 38 percent strength spread on the road. Estimated cost of the salt brine is $4 per ton spread on the road.

For convenience, the commission installed a Deming deep well turbine pump on the well and raised the discharge pipe high enough to fill county trucks. A 5,000-gal. truck drives under the loading line. The operator opens the valve and in a few minutes the tanker is pumped full and on its way, spreading brine where it's needed.

Besides regular treatment of gravel roads, the county also sprays the brine on gravel storage piles to prevent freezing during winter. Under certain weather conditions the salt brine is also used to remove ice from some county highways.



● **At this pumping station, Jackson County, Mich., trucks are loaded with salt brine for stabilizing gravel roads. A Deming deep well turbine pump (insert) pumps the brine from an abandoned wildcat oil well purchased by the county highway commission.**

Consider Your Cost Overhead

In the rising market which characterizes our mid-century economy, the matter of cost is an extremely important factor. This is especially true in the construction field where it is necessary to bid on work today which will be done a year from now and on which there is no price adjustment.

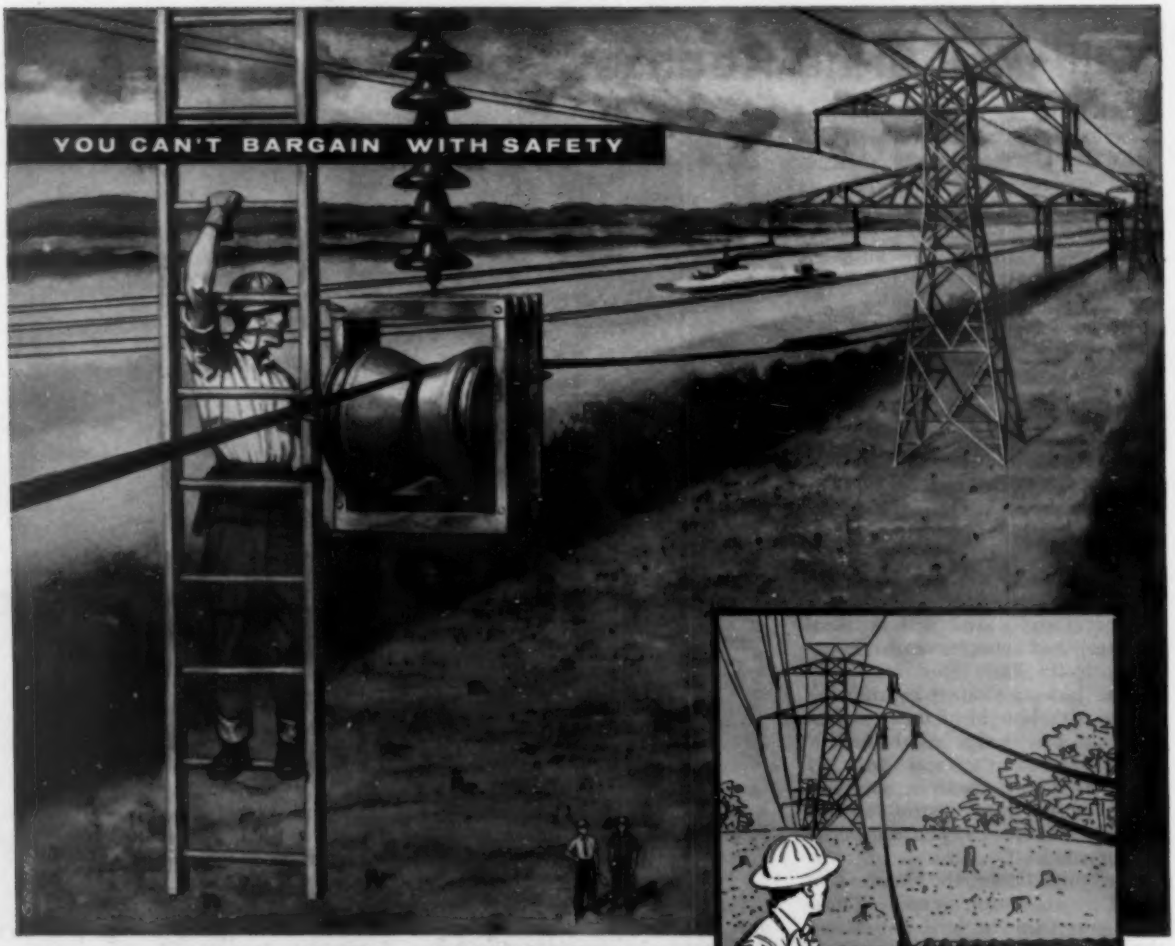
One of the items of cost on which the majority of our contractors are vague is "overhead." In the first place, no two firms agree as to the items which should be charged to this account. Some firms operate on the basis of figures compiled by their accountants for the prior year as to overhead, charging this item on a percentage basis. This tends, in some instances, to make the contractor's overhead charges run two years in arrears.

For survival, check your overhead, verify the items which enter into it and above all, keep it on a current basis in order not to have the major portion of your profits absorbed into increases in this item on which you have used figures that are out of date.—*Virginia Road Builders Association bulletin to member contractors.*

CONTRACTORS' GUIDE. Prepared by Gulf product application engineers of Gulf Oil Corp., Pittsburgh 30, Pa., this 90-page illustrated manual is an exceptionally complete and authoritative summary for heavy equipment users.

The book is written to help contractors make maximum profit on the job through the wisest possible selection and handling of fuels and lubricants. Included are chapters on selection of lubricants; API classification of internal combustion engine service; with special chapters on gasoline and diesel; crank case oil selection; how to choose greases; engine characteristics; the lubrication of engines; air cleaners; oil filters; carburetors; diesel fuel injection systems; valves; ignition; starting diesel engines; also chapters on such supplementary topics as engine temperature control, thermostats and shutters, fans, water jackets, hot weather operation, getting the most out of equipment in cold weather and sections on each of the different mechanical parts of the engine and the equipment.

For free copy of this booklet, the contractor should write on his business stationery to Gulf Oil Corp., Contractors Sales, Pittsburgh 30, Pa., or request it through the local Gulf representative.



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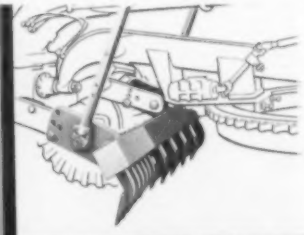

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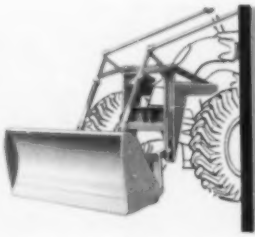
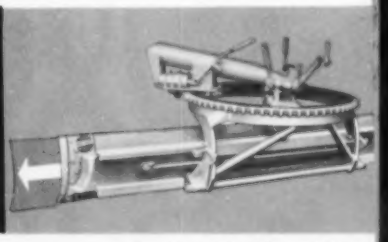
Hancock elevator



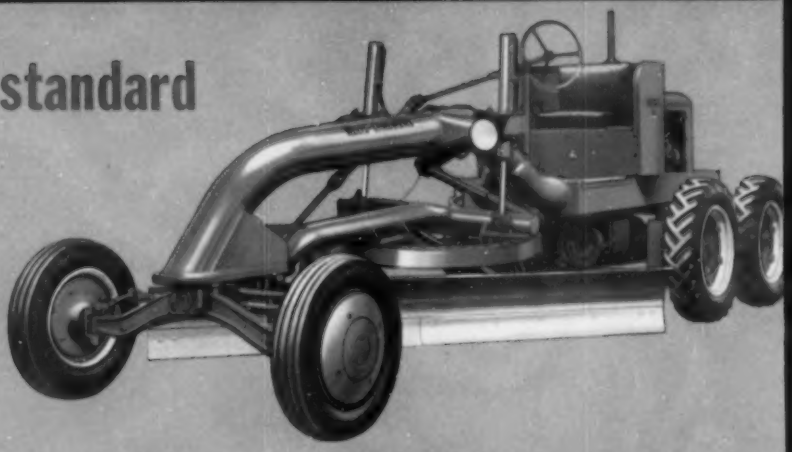
8-foot bulldozer



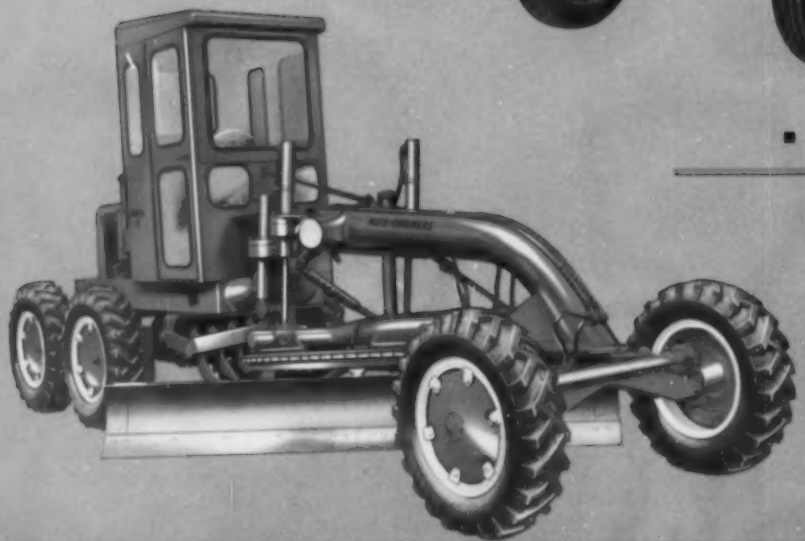
Hydraulic, shiftable moldboard

model D standard

50 brake hp
8,800 lb (gasoline)
9,350 lb (diesel)



...for big economy o



model D special

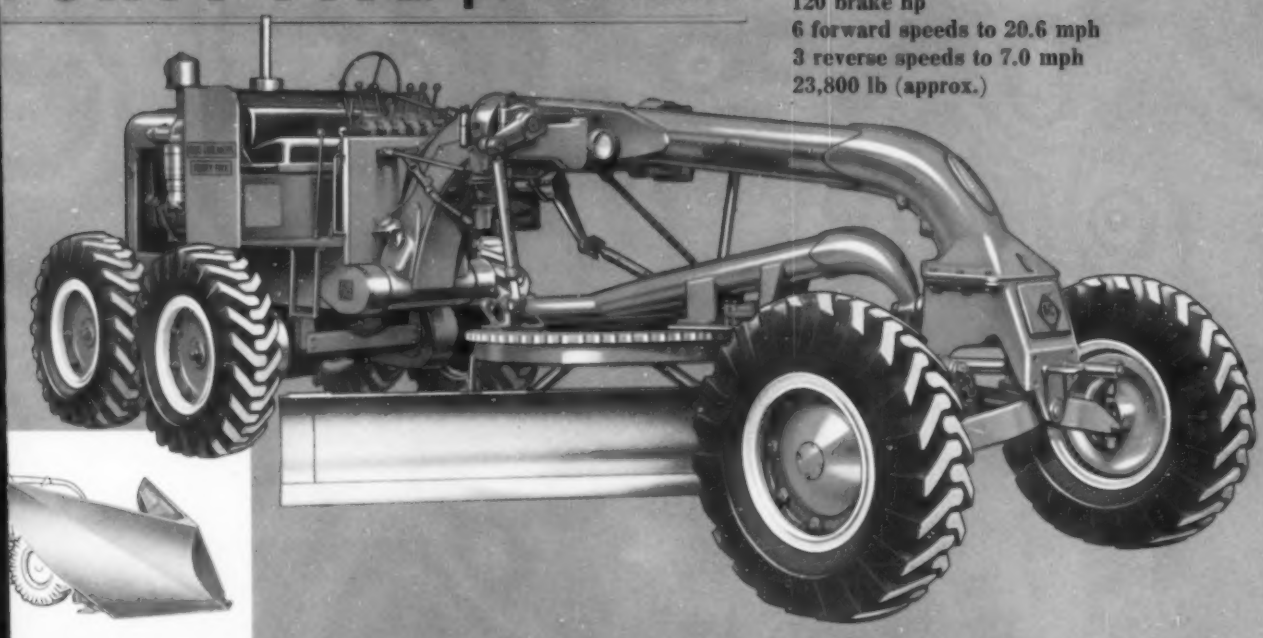
50 brake hp
10,900 lb (gasoline)
11,450 lb (diesel)
4 forward speeds to 25 mph (approx.)
1 reverse speed to 3 mph (approx.)
All-steel cab*

Shiftable moldboard*
Hydraulic scarifier*
Leaning front wheels*
Power circle turn*

**Also available with the Model D Standard as optional equipment.*

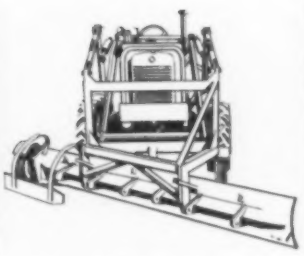
FORTY FIVE performance

120 brake hp
6 forward speeds to 20.6 mph
3 reverse speeds to 7.0 mph
23,800 lb (approx.)

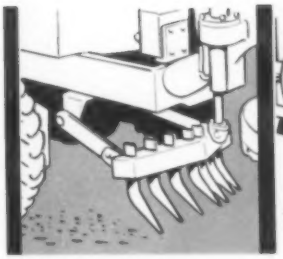


V-type snowplow

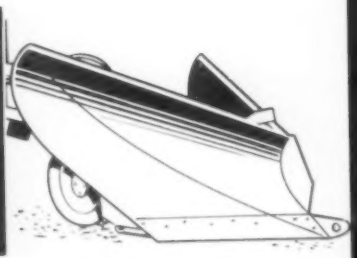
5/8-yd, rear-mounted loader



Interchangeable shoulder maintainer



Midship-mounted scarifier



Blade and V-type snowplows

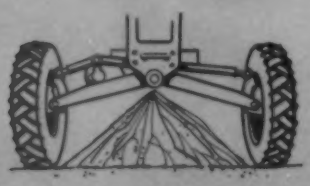
maintenance and construction work get the model D

Here's the original low-cost motor grader with big-grader design and performance advantages. It can be yours at one-third the cost of a large grader. The Model D handles so many jobs so well, you have to see it at work to convince yourself.

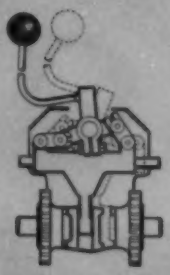
SEE MORE...ALLIS-CHALMERS ENGINEERING IN ACTION

See these big advantages of Allis-Chalmers motor graders in a working demonstration

FORTY FIVE

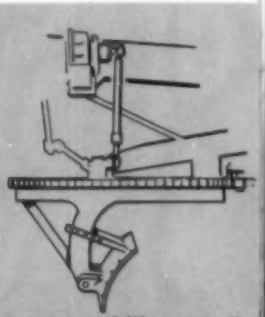


Extra high axle and throat clearance means bigger loads at the blade . . . no power wasted pushing material with axle or circle.



Toggle-type controls are exclusive with Allis-Chalmers. Controls engage or release clutches surely, quickly, without wrist-snapping backlash.

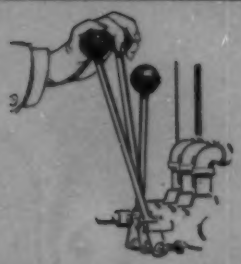
Fully enclosed power steering—full, easy control under any conditions. Hydraulic unit and lines are inside the frame . . . protected from damage.



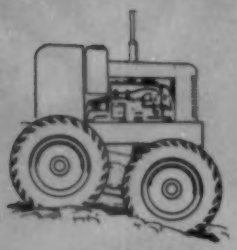
Front-mounted lift cases elim nate long shafts that twist unde heavy loads. Short shafts hol blade steady even on washboar roads.

Model D

Revolving circle and heavy tubular drawbar provide exceptionally stable mounting for the ROLL-AWAY moldboard . . . assure precision grading, trouble-free operation.

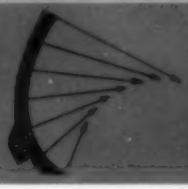


Convenient hydraulic controls—easy to operate. Two levers fit into one hand to control circle lift. Shift lever is next to the seat and directly over the transmission for positive, easy shifting.



Positive tandem drive gives you four driv ing wheels under the heavy end of th grader . . . providing maximum traction all times to make the Model D easier rid ing, smoother blading.

And in both, the exclusive ROLL-AWAY moldboard



The ROLL-AWAY moldboard rolls dirt up and ahead to eliminate packing, reducing friction . . . gives you more performance per horsepower, more production per gallon of fuel.

Look ahead...*move ahead*...and stay ahead

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

Form MS-1304

Litho. in U. S.

THOUGHTS ON HIRING OF CONSULTANTS

THE ROLE of the consulting engineer has become a large and varied one in the highway program. As *Roads and Streets'* review of the subject in April brought out, the state highway departments continue to give the consultant a larger work load, and the departments that use consultants are in the majority today.

The role of the private engineering firm has changed, in that while some remain specialists, others are serving as arms of the departments, handling all phases of highway engineering production work from feasibility studies and route planning, through plans preparation to inspection and job control.

This growth in both the size and the complexity of the consultant's job makes it all the more important that public highway and city officials help maintain the highest standards of ethics in the selection of private engineering firms.

Some officials have felt, sincerely we are sure, that they were duty bound to buy private engineering service on a competitive price basis. "This is sound and in the public interest for the contractors—so why not also for the engineer hired to handle the engineering side of the production job," they may have reasoned.

● There is a quite definite answer to the question as to why there should not be competitive bids for professional engineering services, in the manner that construction contractors are required to bid for jobs. Materials of construction are subject to measurement and testing for quality and workmanship. Structures are built according to carefully prescribed specifications. They can be measured and examined. By adequate inspection during construction defective workmanship can be detected and the excellence of a structure can be substantially guaranteed.

On the contrary, professional engineering services are the result of intellectual ability. It is not reasonable to expect that an engineer of mediocre ability will provide an end result that will be of equal quality with that furnished by a highly competent one, even though there may be no immediate evidence to demonstrate the difference. As a corollary, the one less qualified almost certainly would submit a lower bid in competition and the client would be the loser in the long run. If so inclined, an engineer can cut corners to save himself some money and render inferior service without his client being abel to detect it at the time. Engineering fees constitute a very small part of the overall cost of a project and any "saving" gained by awarding a contract on a low bid basis can be lost many times over as the result of inferior design and supervision, all leading to added costs of construction, operation and maintenance.

● It is because the client suffers that the thoughtful highway or municipal administrator will oppose price bidding. In the case of public works, the ultimate client is the general public and that means that the public welfare is not well served. It is for this reason that the ASCE Code of Ethics carries its Article 4.

It is not good enough however for engineers to say, or imply, that they will not bid just because of some ethical code. That is placing the emphasis in the wrong place. Refusal to bid should be based on a desire to safeguard the interests of the client. Such codes as ASCE's reflects that principle.

● In selecting a consultant there should be ample opportunity to weigh the respective merits or qualifications of various consultants. If a client believes that one particular firm is best qualified for his purpose, there is no reason why he should be expected to first assemble a list of several engineers before making his final selection. The recommendation that several firms be appraised is believed to be sound and particularly appropriate for public officials.

Briefly Noted . . .

There never was a time when bidding should be done with such care, according to advice from several of the contractors association leaders.

In commenting on current bidding and on the persistence of a small percentage of failures among road contractors, Archer Gay of the Virginia Roadbuilders Association recently commented to his members as follows: "Somewhere along the line construction firms are beginning to awaken to the fact that the reduction in bid prices has not been accompanied by any downward trend in the price of either labor or materials. Therefore, any reduction in prices bid must have come from that very thin line between cost and profits.

"A part of the road construction industry's trouble," Mr. Gay told the contractors, "seems to lie in the fact that the contractors are not aware of the weak spots in their bid prices until the job has progressed too far to do anything about the matter.

"In this connection, the Virginia association has authorized a study of a model cost accounting system for highway contractors. This will be made by certified public accountants and reported to members complete with forms for those who desire them."

The problem with any group of contractors still is to get them to really keep and use cost records.

●

The New York state department of public works recently held open house, throwing the doors open to the public for a day. It is understood that quite a throng accepted this opportunity to see what makes a roadbuilding agency tick. Good public relations.

This Contractor Used a Special Ripper, and-

Crushed Material Out of His Cuts

Aggregates for Roads

Crusher and stockpile were located on the road centerline. Material was hauled by scrapers. This cost-saving scheme helped low-bid the job here described.

- **Finished base-course material from the crusher delivery belt is dumped directly to the ground, shaped by a Cat D8 and picked up by Euclids for movement to the point of use.**

- **Seen stationed in front of one of the two large road cuts. Universal 880 Senior R Gravelmaster feeding the dozer and scrapers for direct haul-away.**

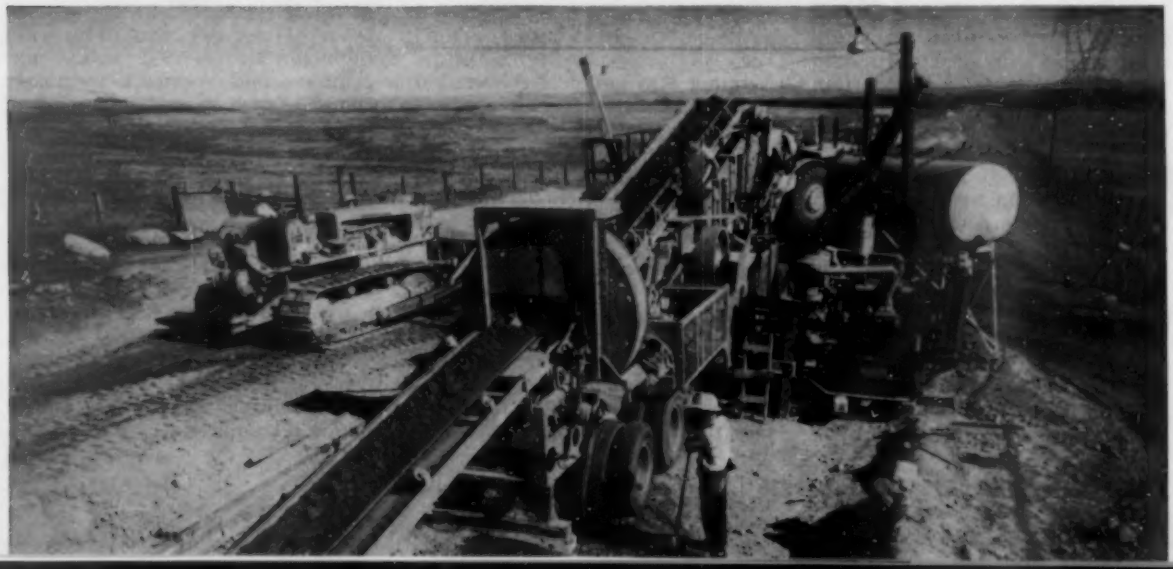
STECKER & SCOTT, engineering contractors of Sun Valley, California, developed cost-saving methods for excavating and processing material, needed for the 5½-mile Rocky Ridge Road link between California Highway 20 and the Auburn-Folsom Road. This road project was completed late in 1957.

The new road gives residents in the Sacramento area a direct route to Folsom Lake where a pleasure-boat haven is being constructed by the state of California.

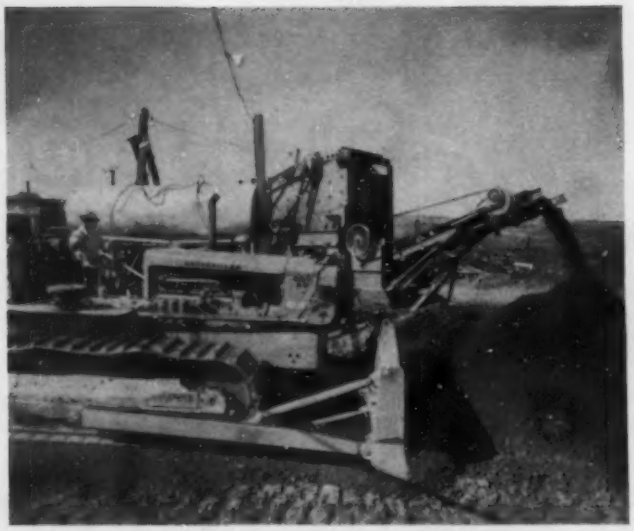
On the Rocky Ridge Road project the contractors used rock taken from the cuts for the base-course and shoulder material, instead of opening and working an off-the-road pit. Quarrying methods were simplified with a rock ripper and a large universal portable crushing plant to reduce blasting costs. Employment of the crusher directly on the roadbed aided mobility and eliminated the truck movement of finished aggregate to the point of use.

Advised that it might take 170,000 lb. of explosives to cut through lava formations in the Roseville area, the contractors proved differently—their total use was less than 4,000 lb.

A 28-ton ripper built by the Peterson Tractor & Equipment



● Bouldery material which was loosened by a heavy ripper. This cut is the project's quarry.



● (Left): Dozer finished base-course material from the crusher delivery belt pushed into position for easy scraper loading. (Right): One of the fills made by Stecker & Scott from the materials crushed and scraper-hauled from cuts.

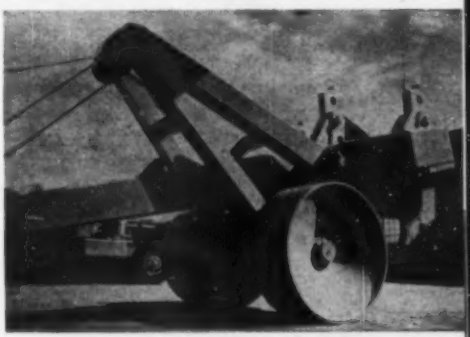
Company of San Francisco and San Leandro, California, helped effect blasting economy. The ripper, equipped with two 14 ft. x 4 in. shanks—6 ft. in length—was guided through the cuts in the lava formation by two Caterpillar D9s—one to push and the other to pull.

Lifeline of the project was a portable Universal 880 Senior R Gravelmaster, this unit reduced excavated material from the cuts to specification size for a 9-in. thick base course and for 8-ft. shoulders. Operation of the crushing plant kept 15 men and eight pieces of equipment working continuously. All deadlines were met as a result of this uninterrupted performance.

The job included 230,000 cu. yd. of excavation. Two large cuts were made—one, 25 ft. deep and 1,200 ft. long; the other, 21 ft. deep. From these cuts 68,000 tons of material were processed to specifications by the crushing plant.

● Big ripper used by Stecker & Scott in the tight bouldery formation which supplied the crusher. (Photo courtesy Peterson Tractor & Equipment Co.).

To speed the job of laying the base material, crushed aggregate was dropped directly from the crusher to the roadbed. A low stockpile was kept shaped by a heavy tractor, and material was moved to the point of use in Euclid 35-ton scrapers, push-loaded off the top of the pile. The contracting firm estimated it would have taken four to five minutes to load a 12-yd. truck with crushed material as compared to about 1½ minutes to load a 35-ton Euclid. Portability of the crushing plant reduced travel distances for the Euclids.



By putting this crusher on the job with rippers and dozers a preliminary estimate of $1.90 per ton for crushing rock and loading out was reduced to 75 cents. This made a $390,000 bid for the job 14 percent lower than that of the closest competitor.

W. Hodgman & Sons, Inc. tells why

"We've pretty well standardized our

Out of 15 motor graders operated, 13 machines are all of one make

"We've pretty well standardized our grader fleet," reports Kenneth Hodgman, Secretary-Treasurer, W. Hodgman & Sons, Inc., Fairmont, Minn. "It's always nice to standardize when you can, because of the savings in parts stocks, faster and easier servicing, and so forth. We've stuck pretty much to Adams† machines, because we've always had good service out of them. And our fellows all like to operate Adams.

"We've been Adams users since 1931, when we bought our first 2 Adams graders . . . 2 No. 51's. We just retired one of those original ones; the other we still use. We now have 2 new Power-Flow 660's, 3 regular '660's', and the rest are '610's' . . . 13 Adams in all. We also have 2 non-Adams."

Use one new grader instead of 2 older machines

"These new Power-Flow 660's really move a terrific windrow. In some cases one of these machines takes care of the same kind of job

†Trademark

ADVERTISEMENT

grader fleet"

we've always handled with two '610's' with 100 hp each. That doesn't exactly mean that they do all the work two '610's' will do. But you need only one — not two — to do the complete job.

"We've had no downtime to speak of. And parts-wise, so far, we haven't spent a nickel on the torque-converter '660's'. Our daily fuel consumption is up, of course, because we are accomplishing a lot more work. Right now I don't have any figures. But watching them move the big windrows, I'd say the Power-Flow is actually cheaper to operate than conventional gear machines. We're now planning to trade-off some more of our older '610's' for new Power-Flow's."

Says Howard Pihlaja, Foreman . . .

"I have never seen anything work like this Power-Flow 660. There is nothing you can't handle with it . . . the best part is the steady power supplied by the torque converter. Also like the forward-reverse shift with foot control."

Road base contractor operates in 6 states

Two million tons of base is a lot of stone and gravel. Yet that's the figure W. Hodgman & Sons, Inc., Fairmont, Minnesota, gave as a measure of its minimum annual road-building business. The company operates mostly in North Dakota, Minnesota, and Iowa; also handles large contracts in Wisconsin, South Dakota, and Colorado.

Hodgman & Sons is primarily a base contractor, with over 26 years' experience in the business. In addition to base work, contractor also supplies asphalt road surfacing where specified. The company operates 4 hot-mix asphalt plants producing over 300,000 tons annually; also handles about 100 miles of bituminous road-mix surfacing a year.

1957 contracts over $4½ million

State jobs provide the bulk of Hodgman's work, with large city and county projects making up most of the balance. Company likes to bid jobs in the $200,000 to $1 million range. Total contracts for 1957 were over $4½ million, with the average job running about $300,000.

All major dirtmoving is let to sub-contractors in that field. While Hodgman owns 4 or 5 scrapers, they are used only for minimum cuts, mostly for clean-up, finishing, etc. The company's main work starts with the finished sub-grade. Hodgman lays the road base or bases, then applies asphalt surfacing . . . usually 24' wide . . . and of the thickness specified.

Big Adams fleet cuts cost

In Hodgman's fleet, motor graders are a principle item of production equipment. The company operates 15 motor graders . . . 13 Adams, 2 of other makes. Because the firm has practically standardized on Adams machines, it gets most of the money-saving benefits of a "solid" fleet: easier and faster servicing, low-cost parts inventory, operator interchangeability, etc.

Latest addition to the Adams fleet are two 190-hp POWER-*Flow*® 660's. The company is turning more to the heavier machines, because it finds their additional work output far outweighs the relatively small hourly extra cost of operating big equipment.

Lowering the subgrade by 12", one of Hodgman Co.'s 190-hp POWER-*Flow* 660 graders takes a generous cut in the subsoil . . . windrows dirt for loading, on Brown County Road #3, near Hanska, Minnesota.

Used just one 190-hp grader for 9-mile regrading and surfacing project . . . *see next page*

Foreman Howard Pihlaja says further:

"I believe Power-Flow 660's have the most efficient set-up on a torque converter that's possible. Temperature of the torque converter oil never gets too high. With a competitive grader, on a hard day's pull, the oil goes up to 220°. This Power-Flow converter fluid runs between 160° and 180° . . . 190° at the most.

"In a day of comparable work, doing the exact same jobs, round for round, I don't think this '660' would use any more fuel than a

"Nothing this POWER-Flow grader

reports Ray G. Lloyd, operator...

Veteran of 21 years' operation likes Adams performance

"I've been with Hodgman & Sons for 21 years, operating 'blades' most all the time. I've run Adams, Caterpillar, Galion, Austin-Western, and A-C patrols. I prefer Adams graders because I like the way they perform . . . they do everything I expect a blade to do."

Always works faster and easier

"This new Adams Power-Flow 660 is an improvement over all graders before. There's just no comparison! I've never run into anything this Power-Flow won't do. I've worked it against other machines, and it always does the work easier and faster.

"In mixing, the old girl really shines. It only takes about 4 passes to mix a windrow with this big '660'. And laying a mat takes just a few more passes than a mix job. Yesterday I laid 3 miles of base . . . and that's a lot of gravel in one day. I got out on the job about 8 AM, and was done a little after 6."

Forward-reverse power-shift saves time

"The feature I probably like best on this Power-Flow is the foot pedal for forward-reverse shift. When you have both hands full with your controls and steering, you don't have to bother about shifting gears, and waiting for the transmission to stop to make your

Big 190-hp POWER-Flow 660 grader, with operator Ray Lloyd at controls, scarifies at full tooth depth . . . rips-up gravel and stone road surface for regrading. Here, on Minnesota's Brown County Route #3, grader cut 12" off the top, before laying 9" gravel base and 1½" road-mix topping.

POWER-Flow 660 cuts tough subgrade material, windrows to center of road for removal. Crawler-mounted front-end loader filled dump trucks, which hauled excess material to widen shoulders and backfill around culverts at other points along the 9.2-mile project.

regular grader. Actually, working with 50 more horsepower, it uses a little bit more fuel oil . . . but it handles more work. If you figure the hourly cost, and discount it by the shorter time it takes '660' to work a mile, you'll find it costs less than with a standard grader."

won't do"

gears mesh. All you do is give the pedal a flip with your foot, and you can reverse or go forward. That speeds-up the operation — and it's much easier on me."

No problem of clutch adjustment

"Another thing, with torque-converter '660' I don't have to worry about clutch adjustment. If you're hogging it, or doing work where you have a tendency to slip your clutch, you could develop trouble with a friction clutch. With this torque converter, I use only my throttle to control speed . . . just don't have any clutch to slip."

ADVERTISEMENT

One 190-hp grader for 9.2-mile Minnesota project

Action photos here show a POWER-*Flow* 660 at work for W. Hodgman & Sons, Inc., Fairmont, Minn. Here this powerful grader is scarifying and blading on 9.2-mile widening and resurfacing project on Brown County Road #3, between Hanska and New Ulm, Minn. Hodgman, prime-contractor, brought in just one torque-converter "660" to handle all the grader work.

Cut 12" thru old surface

On this section, the old gravel roadbed was too high for adding the specified 9" of base and 1½" road-mix topping. So the big "660" with 5-tooth scarifier, ripped-up the gravel and rock surface . . . cut 12" down to sub-grade . . . windrowed the material in the middle of the road. A front-end loader heaped the spoil into dump trucks, which hauled it down the road to backfill culverts and widen shoulders where needed.

Maximum push-power from a dead stop

Veteran operator Ray G. Lloyd worked the POWER-*Flow* entirely in 2nd gear-range, 0.0 to 7.6 mph. Because grader can develop full-rpm push-power from a dead stop, he dug right in for maximum cut . . . easily started the load. He continued at full power as he accelerated with grader's torque converter automatically apportioning more horsepower to forward motion. Working continuously at top-rated power, grader always scarified deep . . . always cut a full blade-load . . . always produced at maximum pace for each particular load.

Protects grader, operator, in rocky soil

Surface and subsoil rocks were a hazard — but they didn't bother the machine or operator Lloyd. Whenever the grader hung-up on a rock, "660's" torque converter cushioned the impact. There was a quick deceleration and a moment's hesitation, before the governor would start to feed more fuel to step-up engine rpm. This gave Ray Lloyd time to either stop and back-up for a new "bite" . . . or to quickly reduce depth of blade or scarifier. Thus he could work fast, without fear of getting himself "banged-up", or of damaging blade, engine, or transmission.

More about POWER-Flow performance . . . how it increases grader work-power . . . cuts non-production time . . . see next page

"We've pretty well standardized our grader fleet"

says Ken Hodgman *(continued)*

Operator Ray Lloyd says further:

"We have a lot of rocks and boulders in this country. When I hit something solid, this Power-Flow machine slows-up and kinda gives with it. If I hit a rock, or hook a curb and gutter, it doesn't throw me, smash anything, or rip-up a curb. When it hesitates, I can adjust the controls or stop the machine. Saves a lot of wear-and-tear on the blade and gears."

Maintenance and fuel costs low

"I'd say there was close to 1000 hours on this Power-Flow. There hasn't been any maintenance on

Adams POWER-Flow 660...Go-power to

On every one of your roadbuilding and production dirtmoving jobs, the GO-power of an Adams POWER-*Flow* 660 grader cuts costs, and increases your profit. Big "660" gives you more push-power, completes tasks faster, spends more time on dollar-producing work . . . reduces grading cost per mile of road, or per yard of dirt. It gives you the precision, and easy-operating advantages of a standard (fixed gear-ratio) "660", plus:

- 27% more engine power
- Torque-converter drive
- Forward-reverse power-shift

Cuts deeper, pushes heavier loads

POWER-*Flow* 660's push-power is not limited by low-rpm engine power in fixed gear-ratios. You can apply "660's" full 190 hp at any speed . . . even from a dead stop! Torque converter gives you the effect of *infinite* gear ratios . . . multiplies torque for starting big cuts and heavy loads, for smoothing out unexpected resistance as you move the dirt. A tail-shaft governor automatically adjusts engine speed (and thereby, the torque multiplication), to produce whatever power you need, for pushing the load at speed called for by the throttle-setting. Engine never lugs . . . never stalls.

Works at fastest rate possible

With throttle at maximum setting, you get full power for the initial thrust to start the load. Then as the dirt starts rolling, grader picks up speed. As less-and-less power is needed for "push", "660's" torque converter automatically apportions more-and-more horsepower to working speed . . . matches power to the load . . . brings grader up to *fastest possible pace* for each bladeful.

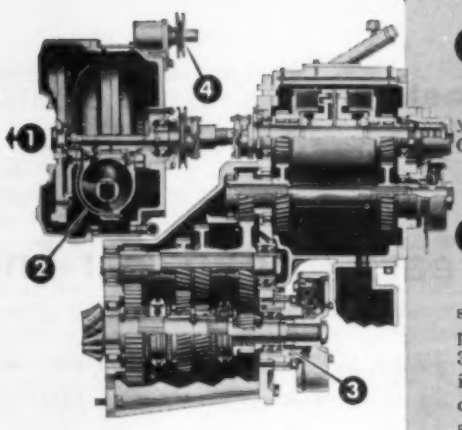
Less non-productive time

POWER-*Flow* also produces more work because it "keeps its nose to the grindstone" . . . wastes less time in travel and maneuvers. Between work assignments, or between tasks on the same job, 190-hp "660" travels at up to 27.4 mph . . . gets on the job fast . . . begins work sooner, finishes it sooner. And, on one-way blading, this grader backs-up at fastest practical speed (to 24.4 mph) . . . starts the next "pass" while other graders are still lumbering back to the beginning of the cut.

On Brown County (Minn.) Route #3, POWER-Flow 660 grader cuts new sub-grade for W. Hodgman & Sons, Inc., Fairmont, Minn. Grader's torque converter matches power to the load . . . always moves dirt at fastest possible rate for each particular blade-load.

it, except for greasing and oiling.

"There's not much difference in fuel consumption between this '660' and friction-clutch graders. It can do the same work as other machines . . . but so much easier and quicker. So, in spite of a small plus in cost, I feel it's actually more economical."



1 190-hp engine:

your choice, Cummins or General Motors diesel.

2 Torque converter:

single-stage type; multiplies load-starting torque 3-to-1 . . . gives effect of infinite gear ratios for continuous full-rpm operation . . . absorbs load shocks and prevents the engine from stalling.

3 Tail-shaft governor:

automatically changes fuel setting to maintain constant grader speed, as pre-selected by operator.

4 Forward-reverse power-shift mechanism:

hydraulically operated clutches — controlled by 2-position foot-treadle — engage forward or reverse gear-sets for instantaneous change of direction, without hand shifting.

boost contracting profits

No delays for hand-shifting to change direction, speed or power

Under normal conditions, your operator starts-off by shifting to the POWER-*Flow* gear-range suited to the type of work. Thereafter, he almost never *hand*-shifts gears again, till the job is done. Here's why:

a. Torque converter automatically provides whatever power-speed ratio is needed to handle changing work loads, as described previously.

b. Foot-operated forward-reverse power-shift permits *instant* change of direction . . . keeps operator's hands free for uninterrupted control of blade and throttle. Toe-pressure on the center-pivoted, 2-position foot-treadle shifts "660" into forward. Heel-pressure shifts it instantly to reverse.

There's no delay, no apparent stop, as grader changes direction . . . forward or reverse. For example, at the end of a one-way cut, your operator simply rocks his heel back on the treadle. POWER-*Flow* automatically power-shifts from forward to reverse, in the same gear-range . . . and without declutching. There's no waiting for gears to slow-down . . . no stopping while busy hands perform many functions. POWER-*Flow* 660 works, maneuvers . . . seldom stops. It produces more per hour . . . boosts your profit on grader operation.

SEE IT WORK:

To really appreciate the GO-power of this machine — its extra work-power and cost-cutting speed — you should see it in action. Write or call us, and we'll set up a date for a demonstration. There's no obligation, of course.

G-1790-DCJ-6

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LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

At WASHO Meeting –

"Three Years Ahead, Far Enough to Plan?"

This question raised by Willey of Arizona was among many administrative and technical topics aired at the recent WASHO meeting at Salt Lake City

LONG-RANGE PLANNING is a wonderful thing, but—", said William E. Willey, Arizona state highway engineer in addressing the Western Association of State Highway Engineers at their annual conference held June 3-5 at Salt Lake City.

Willey in speaking as the association's retiring president then added, "but with the rapidly changing national and world situation I wonder if it is wise and the most economical thing to do, to try and outguess the future for perhaps more than three years at a time. I feel that if a state has a three-year construction program, where annually you drop off a year and add another, then you are pretty well ahead of the situation.

"One overnight development," Willey said, "could knock the whole thing out of kilter if you attempt to plan too far ahead." He also spoke at some length about the problem of highway personnel as people, their problems, their ambitions, and their dedicated service.

"Financing Future Highways" was the subject of a prepared paper by C. D. Curtiss, Special Assistant to the Executive Vice President, American Road Builders' Association, and formerly U. S. Commissioner of Public Roads. Concisely he reviewed the development of the financing of roads from the beginning of the 19th century. He cited how funds were obtained and controlled and pointed out the key phrasing in federal highway legislation. Curtiss also said, "The need for the expanded highway program being rather universally recognized and the engineering shortage on the way to being met by better organization of work, extension of use of photogrammetric methods and electronic computers and the use of qualified consultants, only a few problems remain. Among these problems are the following:

"1. Keeping the public informed on the individual and community benefits to be derived from the program and thus insuring continued support.

"2. Modernizing state highway laws to permit streamlining of department organizations; economical, efficient and prompt acquisition of rights-of-way; and payment of adequate salaries in order to retain present employees and attract new ones.

"3. Insuring an increasing number of civil engineers entering the highway field.

"4. Finally and perhaps most important is the matter of legislative assurance—national and state—of adequate long-range financing."

How factual data are used in planning, programming and budgeting for highway construction was reviewed by R. E. Livingston, planning and research engineer, Colorado department of highways. He stressed the value of keeping the public informed on what is being done, and how and why. Also the value of bringing into the effort as many highway department personnel as can be handled to keep this work effective. His paper concluded with a description of the step-by-step procedure of producing a rating system, an inventory, and a yardstick for gauging needs.

Full coordination of forest road work with other road programs was cited as a basic need by Arval L. Anderson, regional engineer, Intermountain region of the U. S. Forest Service. He explained the classes

New WASHO Officers

President **— W. C. Williams, state highway engineer, Oregon.**

Vice President**—Homer Oxley, chairman, Wyoming State Highway Commission.**

Secretary-Treas.**—T. D. Sherard, deputy state highway engineer, Wyoming.**

States in Road Financing Spotlight

Further quoting Curtiss at the WASHO Conference: "I believe the continued support of those who urged the present legislation will insure the availability of ample federal funds. If this is the case, then the real financial problem rests with the states to provide funds *to take care of debt service where needed, to insure adequate maintenance, to match federal funds, and to continue the needed works outside the federal-aid program.*" • • • "The taxing authority of the cities is limited, but since the residents of the urban areas now pay a very large portion of the state levied taxes, it appears to me that more state-aid in providing the needed expressway facilities (in cities) will be required, or the cities permitted to levy taxes now generally reserved to the state."

and purposes of forest roads, and reminded that all agencies involved in road construction and maintenance have a community of interest; that what one agency does inevitably affects the other; and that the public interest would be better served by having all agencies cooperate where practicable in areas of overlapping and common interest.

The hairline division between policy and administration came in for a down-to-earth discussion by Joseph J. Marsh, vice chairman, Colorado highway commission. As he put it, "The dividing line between the prerogatives of the two, at certain moments, appears to be as thin as the tan on a new recruit to a nudist colony." In concluding he remarked that "It's up to the chief engineer to run the shown in accordance with the broad, general policies established by the commission."

How to conduct a personnel conference in the highway department, was covered by Keith E. England, personnel officer, Utah state road commission. His report discussed salaries, training programs, job descriptions, performance ratings of individuals, fringe benefits of sick leave, and annual leave, management training, retirement benefits, and a new idea—an opinion survey on supervisors among the employees.

The uniformity of design achieved between the various western states, through the WASHO conferences and committees, was a meeting topic. A. R. Abelard, regional design engineer, Bureau of Public Roads. The Malad (Idaho Road Test, conducted by the association, for example proved the need for fully stabilized shoulders, and all of the western states now provide some form of such shoulders. None of these states today uses turf shoulders and none uses a trenched base section for the main travel lanes.

Ohio Department Plans "Skidability" Tests

Special equipment, consisting of a pickup truck with trailer, has been specially fitted out by the Ohio Department of Highways to systematically check the skid resistance qualities of existing pavements on the state highway system.

Special brakes on the trailer wheels are applied in routine testing, and recording apparatus used to measure friction between tire and road.

Donald M. Burmister Gets ASTM's Hogentogler Award

Donald M. Burmister, Professor of Civil Engineering, Columbia University, received the C. A. Hogentogler Award at the American Society for Testing Materials annual meeting in Boston. The award was established by ASTM Committee C-18 on Soils for Engineering Purposes, to be given for an outstanding paper presented at an annual meeting of the Society on this subject. Professor Burmister's paper was presented in 1956.

Traffic Accident Studies Begun in New Jersey

Highway safety studies are in progress on three sections of road on the New Jersey state highway system. Carried out in cooperation of the Bureau of Public Roads, these studies are aimed at determining what correlation exists between accidents and the driver and vehicle characteristics.

The study is one of the requirements of 1956 Federal Aid Highway Act. New Jersey has been joined by 10 other states.

PLENTY OF SHOT ROCK

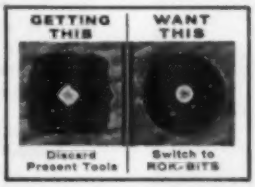
•

Ahead of Slattery's shovels thanks to Brunner & Lay Rok-Bits

Drills: Chicago-Pneumatic Tracdrills.* Bit Distributor: Biondi Bit & Drill Steel Co., Waterbury.

Excavating 800,000 cu. yd. of dense mica schist along a 3.8 mile Connecticut Turnpike section called for fast drilling to stay ahead of schedule. For this tough job, Slattery Contracting Co., Maspeth, N.Y. chose Brunner & Lay carbide Rok-Bits. Rok-Bits gave increased drilling speed, greater footage life, fewer bit changes and lowest cost per foot of hole drilled which all adds up to days and dollars ahead. Jobs that call for top production, call for Rok-Bits. Write for NEW catalog #756. Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. Plants & warehouses—Philadelphia, Asheville, Birmingham, Dallas, Denver, Los Angeles, Albuquerque, Sacramento, Portland, Seattle, Montreal.

*The largest cut was taken in two lifts of 30′ and 28′. Drilling was done on three patterns—8′ x 8′; 7½′ x 7½′ and 6′ x 6′. Brunner & Lay Carbide 3-in. Rok-Bits were used on 1¼″ hex sectional steel and 2⅝″; 2½ and 2¾″ Rok-Bits on 1¼″ round sectional steel.



Brunner & Lay carbide Rok-Bits in these body types—cross, chisel, "X", cutaway, taper socket. Furnished in standard wagon drill and hand held drill threads, also—1000, 700, 600, 400, 200 and J-7.50 threads. Bit sizes up to 7″ in our Hole-Master. Phone our nearest plant.

Brunner & Lay Products

CARBIDE ROK-BITS • INTRA-SET STEEL • DRILL RODS • COUPLINGS, ADAPTERS & EXTENSION STEEL
PNEUMATIC TOOL ACCESSORIES • MOIL POINTS, CLAY SPADES, ASPHALT CUTTERS, ETC.

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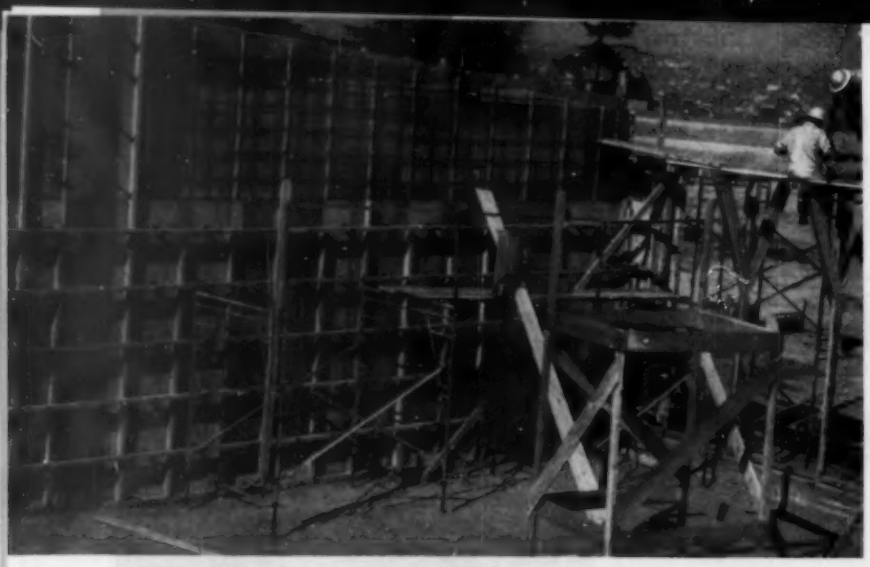
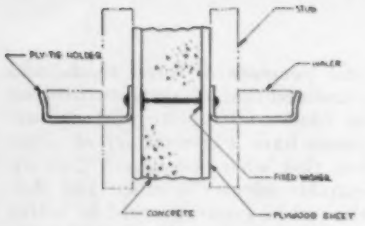
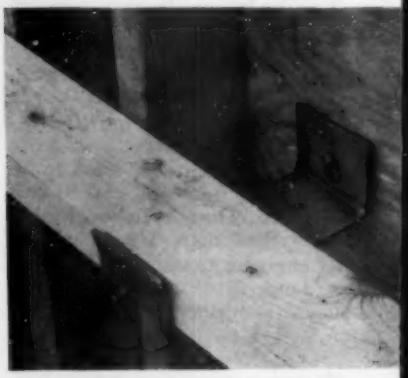


● Trueform system used on Seattle project involving 40,000 sq. ft. of fir plywood.



● How the new form fastener holds both form tie and waler.



● Ply-Tie holding both the form tie and waler in place. Form work can be stripped quickly by lifting waler out of the holder and tapping the holder loose with a hammer.

Fastener Cuts Forming Time

A NEW fastening device for plywood concrete forms, used successfully on bridge construction, speeds up forming by 20 to 40 percent according to its manufacturer, Trueforms, Inc.

The new device, called a Ply-Tie holder, holds both form tie and waler in place and is designed for use with conventional fir plywood panels. One arm of the bracket has a tear drop slot which fits over the head of a special form tie. The other arm of the bracket holds the waler.

The tie holes are pre-drilled in the plywood, using a standardized pattern. The contractor tacks 2 x 4 studs to the plywood with one of the studs backing the joint. The holder secures the form tie and holds the waler in place.

Since the waler drops into a procession of holders along the entire length of the wall, a minimum of nailing is necessary, according to the company. The form work can be stripped easily by springing the walers loose and releasing the tie holder with the tap of a hammer.

The same holder can be used for light, medium or heavy construction by varying the spacing and thickness of studs and walers.

Mullen Construction Company of Seattle used the technique for heavy footings and battered piers on eight primary highway bridges near Lewiston, Idaho. Harry Klaterboss, job superintendent, reported that this method used with standard plywood panels resulted in a saving of time of about 40 percent.

● The system works equally well for medium construction (here shown) or for heavy, being adaptable to varying spacing and thickness of studs and waling.

Nevada H.D. Uses Business Machines Intensively.

The Nevada highway department has fifteen pieces of modern calculating and related equipment, including two tabulators, a calculating and punch unit, a collator, reproducer, interpreter, key punches, verifiers and sorters.

These machines are leased from IBM under a program of stepping up the volume of highway office work available qualified personnel.

● Election of Harold G. Ingersoll, Jr., as president and general manager of the Ingersoll Steel Division of Borg-Warner Corp. was announced recently. Mr. Ingersoll, who formerly was executive vice-president and general manager, succeeds L. G. Porter who now becomes chairman of the Division's supervisory board.

Want a strong drainage structure?

use Corrugated Metal

Corrugated Metal Drainage Structures are *flexible.* A flexible structure deflects under load and gains support from the "passive resistance" of the compressed soil around its sides. That's why it can stand the crushing weight of deep fill and the vibration and impact of heavy loads over shallow fill. Metal drainage products, excellent in all applications, are particularly suitable when the height of earth cover is shallow, or more than 25 feet—in fact, some specifying agencies *require* metal structures under these conditions.

Write for our free booklet "USS Culvert Sheets" which tells you how to get the kind of service you can expect from Metal Drainage Structures made from USS Galvanized Culvert Sheets. It's loaded with information about selection of correct structure sizes, preparing foundations and installation procedure. For your free copy, write to United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

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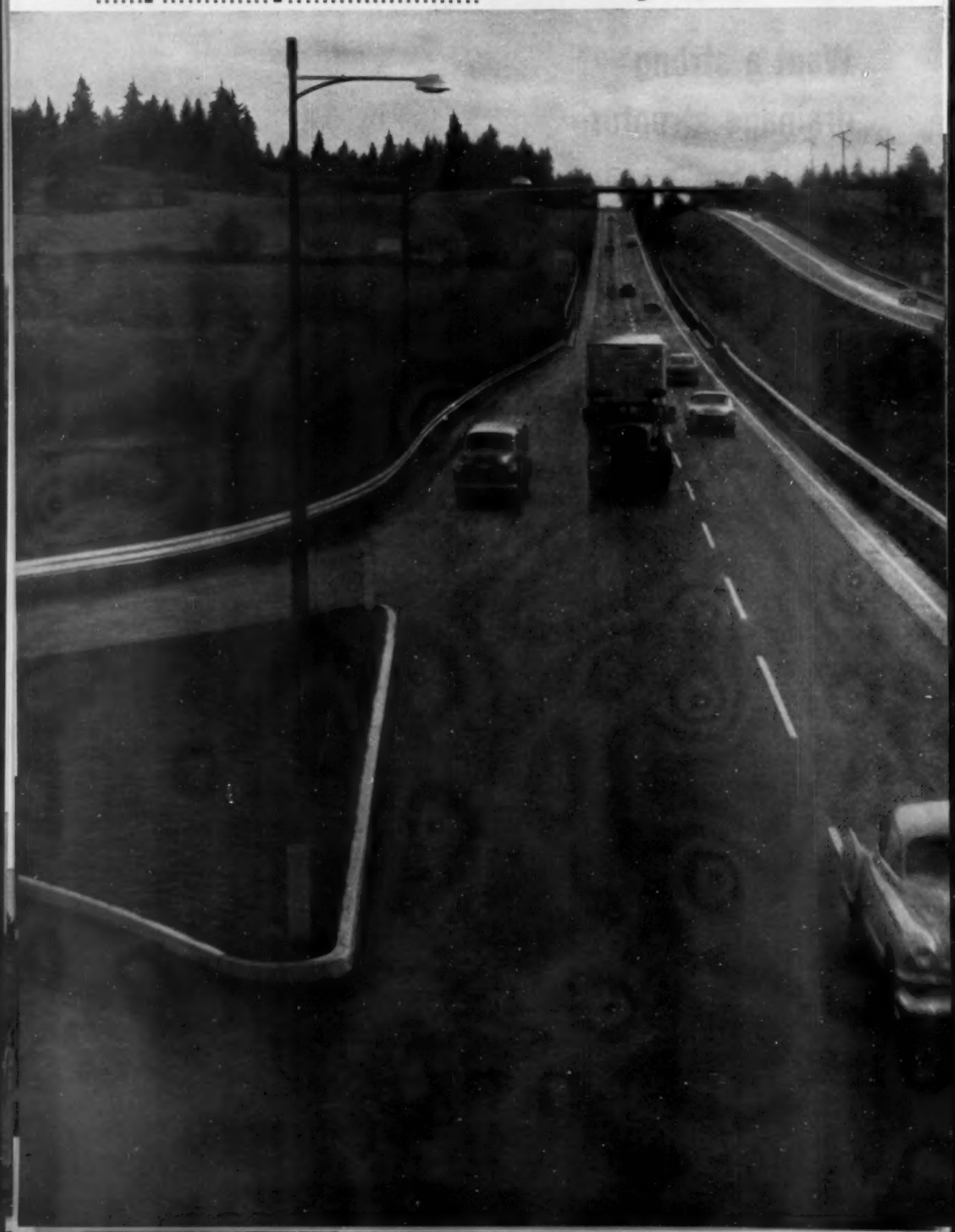
Asphalt pavement water-proofs 93% of



water-rich Oregon's heavy-duty highways

Oregon's growing . . . and fast!

In the luxuriant Willamette Valley of the Beaver State, there's plenty of water for industry and agriculture . . . and a marvelous network of Asphalt highways.

Long ago, the state's engineers learned how to build economical road structures that stand up in country with heavy rainfall. They use a carefully stabilized and well-drained base "roofed" with modern heavy-duty Asphalt paving.

6,594 of Oregon's 7,031 miles of heavy-duty highway are Asphalt-paved.

Asphalt pavements like these are reputation builders. They cost less to build . . . 10% and sometimes up to 50% less*. They cost less to maintain . . . no spalling, adjust to settling, quick repair, less traffic painting needed. They cost less to modernize . . . widen them, strengthen them as you like, construction costs stay low.

The lower costs of Asphalt paving, both initially and annually, stretch highway funds . . . put more money at your disposal to increase your state's highway network, to boost state growth, to improve local roads.

Build *your* reputation on the permanence, the comfort, the safety of durable Asphalt paving.

THE ASPHALT INSTITUTE
Asphalt Institute Building, College Park, Maryland

Beaver State's Interstate Baldock Freeway... Asphalt-paved for wet weather life and safety.

It has been made part (U.S. 5) of the National System of Interstate and Defense Highways. It runs 37.05 miles between Portland and Salem, Oregon. Noteworthy for low cost (despite location over troublesome soil) and built-in safety (gentle curves, headlight screening).

**Saves from $11,768 to $92,628 per mile. Write for details.*

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Structure Pours

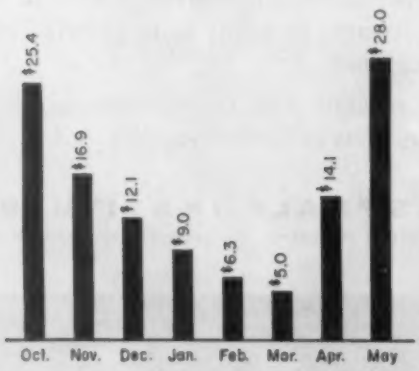
Concrete footings, piers and abutments were poured during all weeks of the past winter except one or two of the very coldest. Plastic tarpaulins and other protective devices were often in evidence.

Last Winter on the Illinois Tollway

How the Contractors Kept Busy

One of a Series on Winter Methods, Problems and Progress

In the old days, everybody left the highway job in the wintertime and hibernated. Around Chicago last winter the contractors found much to do on structures, rock work, peat and equipment overhauls.



● **Showing how winter had the contractors down but not clear out—and illustrating the low ebb due to the wet, blizzardy early spring.**

WINTER still puts a crimp in highway construction. But contractors on the 187-mile Illinois Toll-way project squeezed in a variety of work between snow falls and cold spells in the 1957-58 winter season.

Though no paving and little earthmoving were done, there was activity in two areas: on-the-job work which could be maintained through the winter, mainly structural, rock excavation and peat removal; and general "housekeeping" tasks in preparation for the coming work season, consisting primarily of equipment overhaul and repair,

Rock Work **On Standard-Crowley-Jackson's long, wide, shallow (600,000 cubic-yard) rock cut, where drilling and blasting crews missed only one day due to weather.**

and stockpiling of paving materials

After a comparatively mild period up to Christmas, an old-fashioned chill settled in for the next two months, climaxed by a ten-day subzero wave in February. Pay rolls dropped accordingly—from a season's peak of 15,000 in October, 1957, to 2,500 in January. The figure rose to 15,000 again this May with the resumption of full-scale paving work.

Total monthly payments to contractors on their $275 million worth of projects fell also, from a high of $25 million in October to $5 million in March (see chart).

● But some contractors—with one eye on the schedule and the other on the number of men around the stove—kept up activity in the winter months.

1. An example of this was seen on the contract awarded to Standard-Crowley-Jackson for blasting and excavating almost one mile of shallow rock on the Tri-State Tollway just south of Chicago.

Over 600,000 cu. yd. of rock was taken out between October 1, 1957, and April 1, 1958. The excavated roadway averaged 160 ft. in width, with the depth ranging from 27 ft. up to ground level. The rock in the area was dolomitic limestone.

Drills used were two Joy Champion 58's with 8-in. rock bits, and two Ingersoll-Rand "Crawl I-R's" with 3-in. bits. The 3-in. holes were used mostly for approach ramps at the Halsted Street interchange. Two 2½-yd. Marion 93M shovels loaded to Euclid 25-ton rear dumps. The shot rock was used as fill at three adjacent locations on the toll road.

The coldest weather slowed the pace, but only one work day was lost according to the superintendent.

2. Peat removal was carried on through the winter on one section of the Northwest Tollway, and it was here that occurred one of the few major construction uncertainties encountered thus far on the Tollway.

The original soils profiles failed to show the full extent and depth of peat bogs at certain locations. As it turned out, the joint venture of McCarthy Improvement Co., H. H. Mass Construction Co., and Dillon Stone Co., had to excavate peat in the amounts of 80,000, 650,000 and 100,000 cu. yd. for their three contract sections—nearly double the anticipated quantities.

Where the peat lay in depths of only 6 to 8 ft., it was dug out, and a special sand and gravel fill was deposited by the 'twice-plus-ten' method: the fill was put down to

Aggregates

Aggregate pits and quarries were never idle long during the winter months, in the job of furnishing and stockpiling millions of cubic yards of base and concrete agregates for the 1958 spring push.

Swamp Removal **Peak areas along the northern leg of the Tollway occupied the contractors all winter. Here a dragline is side-casting for wasting spoil in low areas alongside the highway.**

Prestressed Units **The Illinois Tollway's 175 prestressed concrete girder bridges represent perhaps the largest-yet demonstration of the all-weather work possible with this type of construction.**

twice the depth of the peat removed plus an additional 10 ft.

But where the peat lay deeper—down to 25 ft. in some places—it was discovered that lateral movement rendered complete removal impossible. In these situations, the rolling surcharge method of placing suitable material was used.

3. Gust K. Newberg Construction Co. & Hoyle-Newberg Construction Co. brought their grading to a halt on section T-2 on December 1 and spent the winter on concrete structures, pouring 11,000 cu. yd. from November 10 to March 31. This 8½-mile section included 18 bridges, all but three prestressed concrete. This joint venture organization had its own Blaw-Knox ready-mix plant (Heltzel conveyors) from which concrete was delivered to the various sites in eight ready-mix trucks.

4. Consumers Co. was another scene of all-winter activity. This large Chicago material supply firm has one of the four casting yards which are supplying prestressed girders to the toll road. Under the supervision of Armand Gustaferro, this yard turned out 930 girders, totaling 63,000 lin. ft., from October through April.

Output at the Consumers yard was geared to 10 girders a day, with average length being 67 ft., weight 30 tons. Delivery of the beams, which was halted only during the sub-zero wave, was slowed at other times not by the weather as much as inability of the contractors to accommodate them. According to Gustaferro: "We've got 375 girders lying in our yard now (May 1) that we can't deliver. In some cases access roads aren't ready yet; in others the cranes are driving piles and we can't get their use." Such synchronization problems naturally have cropped up on this big, fast project.

● 5. Bears hibernated and geese flew south, but what happened to the equipment when the winter settled over the big Illinois *Tollway* Project?

As found from visits to several contractors, it was usually one of three things: The heavy grading equipment was sent off to other jobs. Or the equipment was parked until spring. Or it was taken into the shop for overhaul. Often the latter two courses were joined.

Some of the grading contractors or their subs had big fleets on hand at season's end. For example, on section T-2, where 3,000,000 cu. yd. of borrow was used from four different pits and roadway excavation amounted to 700,000 cu. yd., grading was assigned to a joint venture of five concerns. One of the five, Krug Excavating Co., decided to bring its equipment into its Chicago suburban shop for winter overhaul. The company had another sizable job during the winter months, so the machines were rotated into the shop one at a time.

6. Stockpiling of aggregate and granular materials was carried on through the winter at some batch plants, while the plan of other contractors was to draw materials as needed. There are four principal aggregate suppliers.

By May 1, paving was ready to go in all sections of the toll highway except on the Tri-State Tollway where shaping and cleaning up of the roadway following the rock excavation was still in progress. By June 1 everybody was paving and the summer season of paving some 125 dual miles plus ramps and crossroads was on. August is the target opening date some segments, Christmas for the remainder.

Contractor Holds Pre-Season Maintenance Conference

A GOOD MANY of the more progressive contractors these days are holding staff meetings before getting out on the job in the Spring, as a means of tightening up their efficiency. An example is that of Austin Paving Company of Dallas, Texas. This firm on April 15 held a Preventive Maintenance and Safety Conference for its executive staff.

The firm's president, Tyree L. Bell, first assured that the company had lots of work in the months ahead. Then vice-president Walter N. Hill led, along with other company executives, in further keynoting the meeting before it got down to procedures.

"A big percentage of the cost of the entire paving operation is in equipment," said Mr. Hill. "If we can cut our equipment cost through preventive maintenance and safety measures, we can conceivably double our profit."

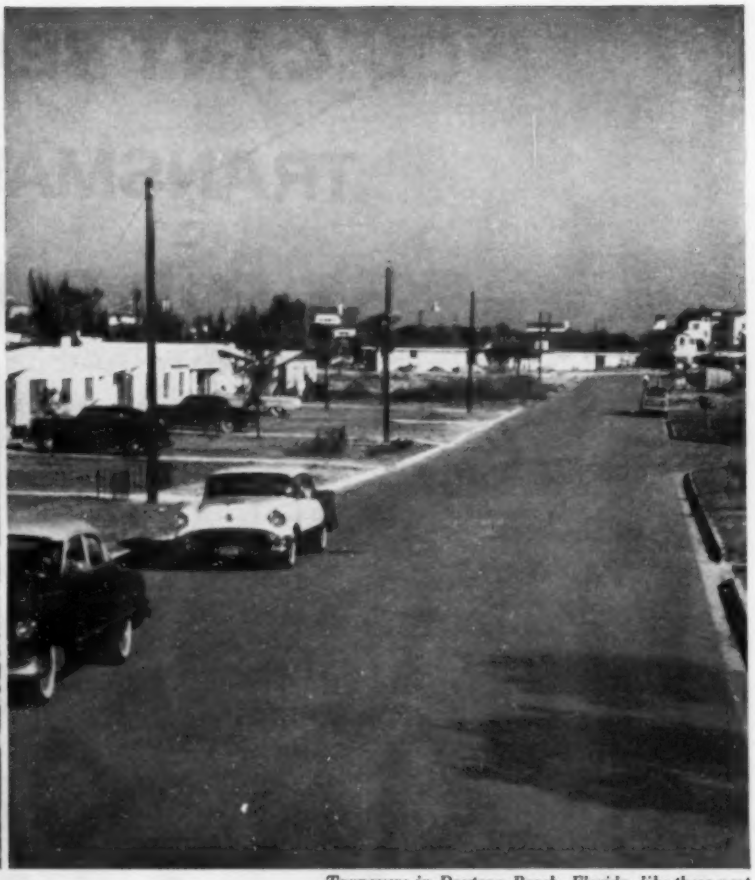
This executive urged all foremen and mechanics to take full advantage of weather downtime, in order to have equipment working at top production when in action.

Such a conference is an annual affair with Austin Paving Company, the firm having found that it pays to give the staff a fresh reminder of the importance of keeping equipment in good condition, as well as in the day-to-day procedures that must be followed.

● **Austin Paving Company's personnel, photographed at the firm's annual springtime maintenance briefing.**

Now is the time for soil-cement...

New subdivision. Soil-cement would be a "natural" here.



Taxpayers in Daytona Beach, Florida, like these neat, low-cost soil-cement streets.

Soil-cement is the low-cost street that grows stronger year by year!

The maintenance crew can all but forget about the streets paved with soil-cement. It holds up like no other low-cost pavement.

Soil-cement gains strength from the minute it's placed. Core tests show it's often double in strength after several years of use.

Soil-cement is stronger inch for inch than any other pavement short of concrete. And its beam strength spreads the load over the subgrade. No softening, no potholing, no break-up in any climate. It's the 20-year-plus pavement. Maintenance costs *stay low.*

First cost? That's low, too, because in most cases 75% of your materials are free. You need only mix portland cement with almost any soil, then apply bituminous surface to the hardened base. In the case of old streets, the surfacing can be salvaged and mixed right in.

Paving is quick and easy. Contractors can build several blocks a day. Every day more engineers are finding that "now is the time for soil-cement." *Write for free booklet, "Soil-Cement Pavement."* Distributed only in the U.S. and Canada.

Low cost . . . it's the 20-year-plus pavement for

ROADS • STREETS
SHOULDERS • SUBBASES
AIRPORTS • PARKING LOTS

MODERN **soil-cement**

PORTLAND CEMENT ASSOCIATION
Dept. 6-28, 33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete

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"YOU CAN'T BEAT FORD'S TRANSMATIC DRIVE FOR OUR WORK!"

Says Raymond E. King, Partner
King Construction Company
Hesston, Kansas

"For off-the-road work and hauling out of sand and gravel pits our Ford two-tonner with fully automatic transmission sure handles the loads

"We've put 42,000 miles on our F-600 dump in the last 9 months and are very satisfied with it. Gas mileage is good and tire wear is reduced. Another big advantage of Transmatic Drive is that you don't tear up axles coming out of sand pits. Also, its torque converter multiplies engine torque to get loads started and prevents harmful engine lugging. To do our job with a truck not equipped with Transmatic Drive would mean buying a truck at least one size larger."

Finance the easy one-stop way!
Ask about the new
FORD FLEET TRUCK FINANCE PLAN!

Bring extra savings to your business . . . make your next truck a FORD!

Official registrations for 1957 show that *American business buys more Ford trucks than any other make.* There are many reasons for this popularity . . . many reasons for *you* to make your next truck a Ford!

To begin with, Ford offers a complete line of over 360 truck models, ranging from pickups to giant tandems. And there are Ford Dealers almost everywhere, ready to help you select the truck best suited for your individual job. They're ready with modern service facilities, trained mechanics and low-priced Ford parts to keep your trucks on the job, earning for you.

Ford trucks are your best buy! Ford's initial costs are *low* and resale value is traditionally high. The modern Ford Styleside pickups are the lowest-priced models available with full cab-wide body . . . giving you 23% more loadspace than any traditional pickup box.

Value-packed Ford Tilt Cab trucks offer exceptional payloads, maneuverability, service accessibility and driving ease. They're America's most popular tilt-cab line *by over two to one!*

Only Ford offers the economy of Short Stroke power in all engines, Six or V-8. And Ford's Heavy Duty V-8's offer new, advanced durability features. The modern Ford Six, available in Light and Medium Duty F- and P-Series trucks, is equipped with an economy carburetor that gives you up to 10% greater gas mileage. It's plenty peppy, too, with more horsepower per cubic inch than any other six in its class.

Ford's rugged cab and chassis construction means these new '58s are built to last. Every Ford has safety glass in every window. All this plus proof that Ford trucks last longer adds up to America's No. 1 truck value.

See your local Ford Dealer for the latest in '58 trucks or the best in A-1 used trucks.

King Construction Company's Ford F-600 with 178-hp Heavy Duty V-8 engine is an all-around performer. Transmatic Drive enables driver to easily back truck into position.

Carrying 5 to 6 yards of sand or rock, this Ford dump truck hauls many loads daily from nearby production sites.

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

. . . for more details circle 272 on enclosed return postal card

A-W Hydraulic Crane shown bending pipe-type cable at Wright-Patterson Air Force Base, Dayton, Ohio. Two hydraulic outriggers on the sides of the crane hold the pipe while the boom pulls it up into the desired curve.

A-W Hydraulic Crane proved excellent on high-precision electrical project

says Helldoerfer-Castellini, Dayton, Ohio

One of the pioneers in laying underground pipe-type cable, Helldoerfer-Castellini recently completed its largest installation of this kind at Wright-Patterson Air Force Base. The project, which involved laying 10,000 ft. of new cable, cost $2.5 million. Putting the 69,000 v line underground removed the serious hazard of overhead line interference, greatly increasing safety in landings and takeoffs.

The company informs us: "For the single crane we needed to handle this pipe, we made a thorough study of the field, and chose an A-W for several reasons: it is more adaptable and maneuverable than other cranes; it is safe around substations; it has no long cables, the possible snapping of which would be very dangerous; its dependability assures low downtime.

"The 6-in. cast iron pipe sections were 40 to 45 ft. long and carried conductor cable drawn into them before being lowered into the trench. Unusual care was required in handling, bending and installing these pipe sections because of a special insulation to protect them from corrosion.

"The A-W crane proved its capacity for handling pipe, fittings and material for the towers with precision and safety—both to personnel and the things it carried. The only alternative was rental of an $18-an-hour crane. We saved well over $100 a day by deciding to buy an A-W instead."

For complete details on this installation, write for Certified Gould Report No. 5704.

Austin-Western CONSTRUCTION EQUIPMENT DIVISION, AURORA, ILL.

BALDWIN · LIMA · HAMILTON

Power graders • Motor sweepers • Road rollers • Hydraulic cranes

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Aluminum Frameless Dump Trailer

Shows Advantages on Toll Road Job

New unit, thrown in with fleet of ordinary trucks, demonstrates how reduction in dead weight and improvement on maneuverability pay off in aggregate hauling.

WHEN A & J Cartage, of Summit, Illinois, was awarded the subcontract to haul No. 2 sand from a pickup point in Elgin, Ill., to a dumping point on the Tri-State Toll Highway near Summit, Ill., the firm was required to solve certain critical problems. The hauling distance was so great that only four round trips per day were practicable. Therefore it was important to haul as much sand as possible on each trip.

The logical equipment to use in a situation of this kind is a dump trailer, with its greater carrying capacity. However, the combined weight of a dump trailer and tractor limit the size of the load that can be carried if state highways are used.

A & J Cartage is hauling materials for this job over Illinois state highways, where the maximum gross weight of a loaded tractor and trailer is limited to 68,000 lb. In order to carry the maximum load within the legal limits, it is important that the trailer used be as light in weight as possible.

● The loading conditons further complicate the problem. The trailer must drive up to the sand dump along a deeply rutted sand surfaced roadway, bounded on one side by the sandpile and on the other by shifting sand and a ditch. In bad weather, there is a good possibility that a conventional loaded trailer might be difficult to maneuver and possibly get stuck.

By using an Aluminum frameless dump trailer made by Anthony Company, the firm has solved all three problems. The trailer has a payload capacity of 18 cu. yd.

A 23-ton load of sand is carried on each trip from Elgin to the toll road site near Hinsdale. The combined weight of tractor and loaded trailer are within the legal limit of 68,000 lb. The trailer alone weighs 7,300 lb.; the entire rig with tractor, 22,000 lb.

The trailer, weighing 2½ tons

● **The Aluminum frameless dump trailer tips the scales 5,000 lb. less than a conventional steel trailer of the same capacity.**

● **Sloping tailgate and deep offset tailgate hinges permit high, clean piles. The brakes of the trailer have been set, and the tractor rolls back as the body is lifted.**

● New in the Illinois area is the air-operated tail gate. Here, an A & J Cartage driver flicks the toggle switch to open the tailgate. Red light, right of switch, shows when tailgate is open.

●Trailer maneuvers over soft sand and deep ruts in picking up load of sand for Tri-State Toll Road job.

less than a conventional one, is enabling the cartage firm to carry 2½ tons more payload each trip—10 additional tons each working day, or 60 tons a week. The same figures expanded to a season's total would represent a striking sum.

At the sand pickup point, the trailer is proving easy to maneuver on the sotf roadbeds and grades produced by shifting sand. Since the trailer's overall wheelbase is shortened, more load is transferred to the tractor wheels. This gives the improved traction required for maneuvering. This feature is reportedly particularly useful when A & J Cartage uses the trailer for spreading operations on soft roadbeds.

● There is no danger that either the tractor or the trailer might become firmly stuck. Should the tractor become stuck, the trailer's brakes are set, and the Teleramic telescopic hoist raises or lowers the trailer. The force from this hoist, with a rated capacity of 25 tons, moves the tractor free of the rut.

If the trailer is stuck, the tractor brakes are set. The trailer is raised or lowered to shift the trailer wheels out of the rut. Then the tractor pulls the trailer forward.

At the sand dumping point, the sloping tailgate has permitted high ground clearance even at the sharpest dumping angle. For stockpiling, the trailer brakes are set, and the tractor rolls back as the trailer body is lifted.

The hoist of this trailer is mounted at the absolute front of the body. Because the hoist lifts naturally at the front, the trailer has shown itself to be well controlled againt tip-over during maneuvering on soft roadbeds and tipping at sharp angles.

● Unloading is expedited by the air controlled dump trailer tail gate. This unit, which is being used for the first time in the Illinois area by A & J Cartage, features a simple toggle switch on the front panel of the tractor's dashboard. The driver simply flicks the switch to open or close the tailgate.

In one position of the switch, the tailgate is completely closed, and in the other position it is completely open. A red light on the dashboard is illuminated whenever the tailgate is open.

With the tailgate switch, it is not necessary for the driver to lean far out of his cab to grasp a rope connected to a manual tailgate control handle.

Mr. Anthony Jalovec, Jr., of the A & J Cartage Company, points out an interesting consideration in connection with the Aluminum dump trailer. "We've heard a lot of favorable comment on using this new trailer for carrying larger payloads over state highways. But some people ask whether they can use it to advantage in short hauls that don't go over regulated roads. There's a simple answer to that question. Even if you don't have to stay under a load limit, it's always better to carry the biggest possible load in the lightest rig that will carry it."

Iowa Commission Issues Highly Readable Report

The report for the 1956-57 bienium of the Iowa State Highway Commission is another excellent example of the "new look" in annual reports.

Entitled "Highways to Happier, Safer Living", it is a professionally produced pictorial booklet designed to dramatize with charts and maps and easy-to-read figures the work done in behalf of taxpayers and the travelling public.

Notable among the accomplishments of the year reported were completion of 459 miles of pavement widening, and widening of 52 bridges, along with resurfacing in conjunction.

Texas Department O.K.'s Temporary Utility Agreements

The Texas highway commission has adopted a policy of permitting temporary agreements on the cost of utility relocations caused by road construction until the courts decide who must pay. Attorney General Will Wilson has filed test suits to obtain a court ruling on whether the state or the utilities should pay the relocation cost.

● Charles R. Tyson has been elected executive vice president of The Colorado Fuel and Iron Corporation. Mr. Tyson is also executive vice president of John A. Roeblings's Sons Corporation, a wholly-owned subsidary with headquarters in Trenton, New Jersey.

ILLUSTRATED GMC FW556 MONEY-MAKER is just one of a complete line of GMC's *extra-stamina-engineered* for construction work. They're available with conventional, dual-purpose or c.o.e. cabs – gasoline or Diesel power – regular or Allison Torqmatic* transmissions.

**Optional at extra cost*

Now-haul 7 yards of mix every trip

in nearly all of the 48 States!

GMC's spanking-new FW556 is your truck! For no other regular, in-production model anywhere can haul 7 full yards at a clip – even in states with limitations as low as 46,400-lbs. gross.

You see, this rig's all "muscle": with ⅜-inch heat-treated frame rails that eliminate the need for reinforcement–rubber "biscuit" mounting instead of steel springs–aluminum saddles and wheels.

The pay-off is a vehicle weight of only 11,087 pounds. Add 6,760 pounds for a lightweight mixer, and you still have room for 28,350 pounds of payload – all within a 46,200-lb. total.

Power to haul these extra-size loads comes from GMC's 370-cubic-inch V8. It delivers 232 high-torque horsepower that takes on the toughest on-and-off-the-road work without breathing hard. And it turns the 7-yard barrel, too – through its front-end PTO.

But the real eye-opener is its price tag! For all these advantages are yours at a figure *hundreds of dollars* lower than anything else close to its class. Check that at your GMC dealer's!

GMC TRUCK & COACH–*A General Motors Division*

GMC-America's Ablest Trucks

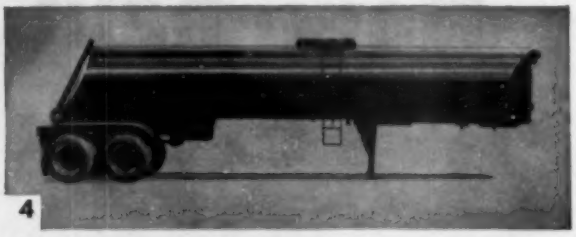
Available in Models from ½ to 45 tons

. . . for more details circle 277 on enclosed return postal card

All The Hauling Equipment You

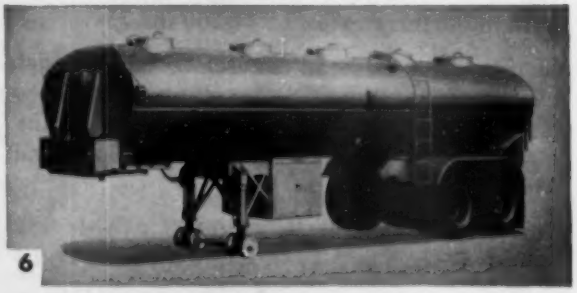
New cable dumps—Designed to resist shock loads and minimize vibration, the latest Fruehauf-Schonrock Cable Dump remains the lowest cost, most economically maintained sand, gravel, and dirt carrier in the business. A semi does the work of a hoist combination, without costly hoist mechanisms. It pulls itself or tractor from ruts, operates in tight quarters with tractor turned up to 90° from Trailer.

Aluminum hot commodity tanks—8700 pounds complete is the light, light weight of an all aluminum 6400 gallon Fruehauf asphalt tank insulated and equipped for 400° temperatures. Exclusive Fruehauf automatic welding processes are typical of the advanced, unmatched quality of Fruehauf tanks.



Steel hot commodity tanks—Fully insulated hot asphalt tanks with steel frames and steel or aluminum jackets can be equipped for even temperatures up to 400° and with a wide range of optional features. Units in a wide range of capacities are kept in stock for immediate delivery.

Airslide* bulk cement tanks—Fruehauf Airslide units are adaptable to both semi and train operation. Initial cost and maintenance are low because of the mechanical simplicity. Gravity does most of the discharge work with the aid of air blown through angled fabric panels. *(*Airslide—Trademark, Fuller Co.)*



Screw type bulk cement tanks—Up to 10% *extra* bulk cement can be hauled in Fruehauf's new "Twin and a half" screw-type Bulk Cement Trailer because of its drop-frame construction. Discharge is rapid, cost and upkeep economical, because material is moved by twin front screws and a single rear screw.

Need For Any Construction Job!

The Trailers designed for the biggest payloads are all Fruehaufs

7

New lightweight platforms—Lighter by up to 1200 pounds than previous steel platforms, the new heavy duty Fruehauf Workhorse utilizes 19½" deep steel I beams as direct supporting members for lift trucks and loads, has full width I beam cross-members for added structural strength.

2

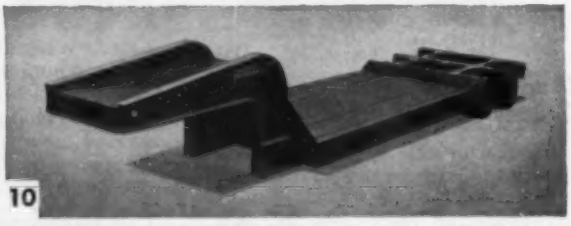
New hoist dumps—Front-mounted hydraulic telescopic hoist dumps are designed by Fruehauf in capacities up to 13 cubic yards of sand or gravel, 25 of rock. Tandem units feature the "no-hop" P2 underconstruction, deep I beam frame members, 21′, 22′, 24′, and 26′ bodies, several chassis lengths, and ICC lights.

8

Low cost multi-purpose platforms—Quality features at low, low prices distinguish this husky, all purpose flat bed, which is ideal for hauling heavy builders' materials, light machinery, and bulky installations. Single and tandem axle units are available, from 27′ to 42′ long.

9

Winchless removable gooseneck carryalls—No hydraulic assists or winches are required on these Fruehauf carryalls in capacities up to 50 tons! Front end loading and unloading of huge shovels is reduced to minutes, and coupling or uncoupling is easily handled by a driver, without shock to loads.



10

Single and double drop carryalls—Fruehauf builds the world's huskiest line of carryalls of all types in a full range of capacities. Single and double drop units for loads of 25 to 75 tons are always ready for quick delivery and specials for larger tonnages are designed to your specifications.

A Full Line Of Moneymaking Fruehauf Construction Trailers—
One For Every Kind Of Job—Ready For Immediate Delivery When Needed!

FRUEHAUF TRAILERS

World's Largest Builder of Truck-Trailers

FRUEHAUF TRAILER COMPANY

10949 Harper Avenue • Detroit 32, Michigan

PLEASE SEND FURTHER DETAILS ON FRUEHAUF CONSTRUCTION UNITS CIRCLED:

1 2 3 4 5 6 7 8 9 10

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

. . . for more details circle 273 on enclosed return postal card

Job and Equipment Ideas

● Setting 40-ton concrete beams for Iowa bridge.

Special Cranes Handle Extra-Long Beams

An example of expert crane handling was seen recently when two specially equipped cranes lifted a 101 ft., 40 ton concrete beam into place on the Des Moines River Bridge. The beams are the longest of their kind in Iowa. Jensen Construction Co. and United Contractors of Des Moines are fabricating the post-stressed concrete beams at the job site.

Two beams per day were produced with a total of 84 required to complete the project. The bridge will carry traffic on combined Interstate 35 and 80 north of Des Moines.

● Handy Split Door Used on Contractor Field Parts—Napol Building

Drop Blade Section Gouges Trench Backfill

Contractor L. W. Fleming of Glendale, California, who owns an International Drott TD-6 4-in-1, improvised an 18-in. steel lip and bolted it to the cutting edge of the bucket for gouging out temporary pavement of a Los Angeles street. This special lip penetrated 10 to 16 in. deep.

Previously, a gas line had been laid down the center of the street and then backfilled. A temporary patch was then laid over the filled excavation so that traffic could be resumed. When it came time to rip out the temporary patch and lay the permanent blacktop, the contractor built the steel lip, which not only excavated the temporary filling but made it easy for the material to be loaded out by the tractor.

This arrangement permitted the contractor to block off only an 8-ft. wide section of the street so traffic could move without interruption on either side during the entire operation. The ability of the Four-in-One clam to push the material far to the front of the truck, while loading from the rear, was another major factor in the uninterrupted flow of traffic.

Half Doors for Field Supply Building

During warm weather this half door arrangement, with the lower half closed and latched and the upper half open to the breeze worked out well on a New Mexico project.

Seen at the Parts Depot, next door to the field shop of Metropolitan Paving Company of Oklahoma City, which handle the $2 million grading job on U.S. 85 near Santa Fe.

The latched lower door discourages casual pilfering, and wandering in and out of unauthorized personnel during working hours.

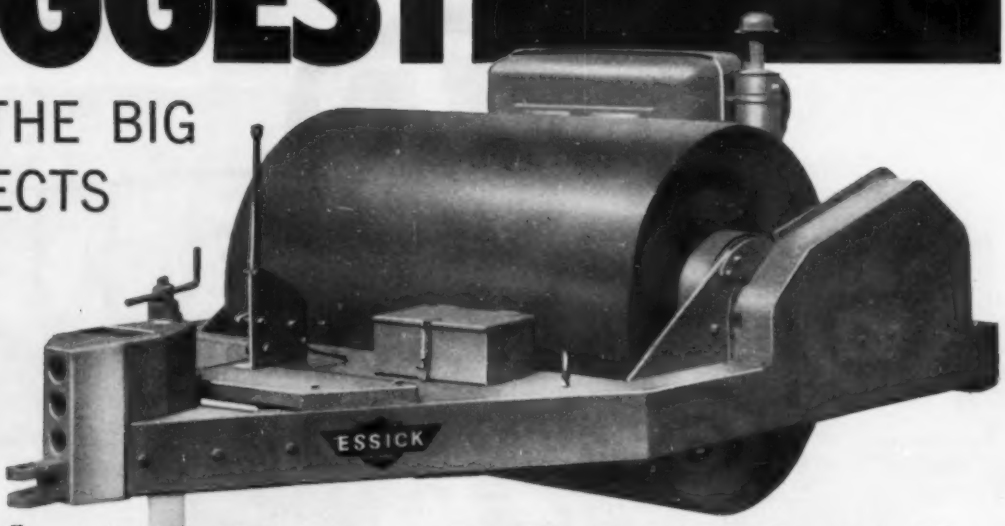
● (1) Same machine gouges out temporary paving material and loads it into trucks. (2) Flat truck body used as part of in-line operation of equipment under traffic.

NOW THE BIGGEST

ESSICK

VIBRATING ROLLERS

FOR THE BIG PROJECTS



72" WIDE 580 TONS

PROVED IN ACTION

LOS ANGELES DEPARTMENT OF WATER AND POWER, SCATTERGOOD STEAM GENERATING PLANT, EL SEGUNDO, CALIFORNIA
Compacting Beach Sand For Fuel Tank Foundations

SAN DIEGO STEAM GENERATING PLANT, SAN DIEGO, CALIFORNIA
Compacting Foundation Fill For Complete Project

JAMES AND ALDRICH CONSTRUCTION COMPANY, AMARILLO AIR FORCE BASE, AMARILLO, TEXAS
Compacting Clay Soil For Jet Runways

WALTER RADKOVICH COMPANY, CONTRACTORS, SANTA MONICA STORM DRAIN PROJECT, SANTA MONICA, CALIFORNIA
Re-fill And Compacting Over Concrete Drain Pipe System

RADCO CONSTRUCTION INCORPORATED, ALTADENA STORM DRAIN PROJECT, ALTADENA, CALIFORNIA
Re-fill And Compacting Over Concrete Drain Pipe System

Big, Husky, Powerful

With the tremendous compaction of 580 tons of kinetic energy developed each second, the Essick 72" vibrating compactor has proven it can cut more than 50% from spreading and rolling time required by any other methods now used for compacting earth fills.

High frequency vibrations, (*in contrast to low frequency vibration of other makes*), together with the 580 tons of kinetic energy per second move an extra large pool of earth particles, keying them together into a dense mass ...meeting the most rigid compaction requirements in record time.

The Essick Model VR-72-T has successfully compacted lifts up to 7 feet of granular material and lifts from 2 to 5 feet of heavy soils having a clay content of more than 45%.

The VR-72-T produces maximum compaction through *high frequency vibrations* utilizing a scientifically engineered power transmission system. Where other equipment has failed, Essick vibrating rollers provide continuous production year after year.

The Model VR-72-T is designed for the contractor whose present equipment cannot achieve required densities...whose compaction costs are too high... whose equipment investment, operation, maintenance, haulage, and storage costs are excessive—anywhere in the compaction field where present equipment and methods are costing precious dollars, the Essick Model VR-72-T vibrating roller will do the job better at a greater profit.

OTHER VIBRATING ROLLERS 13", 28", 32" AND 54" WIDE. ALSO A COMPLETE LINE OF STATIC WEIGHT ROLLERS.

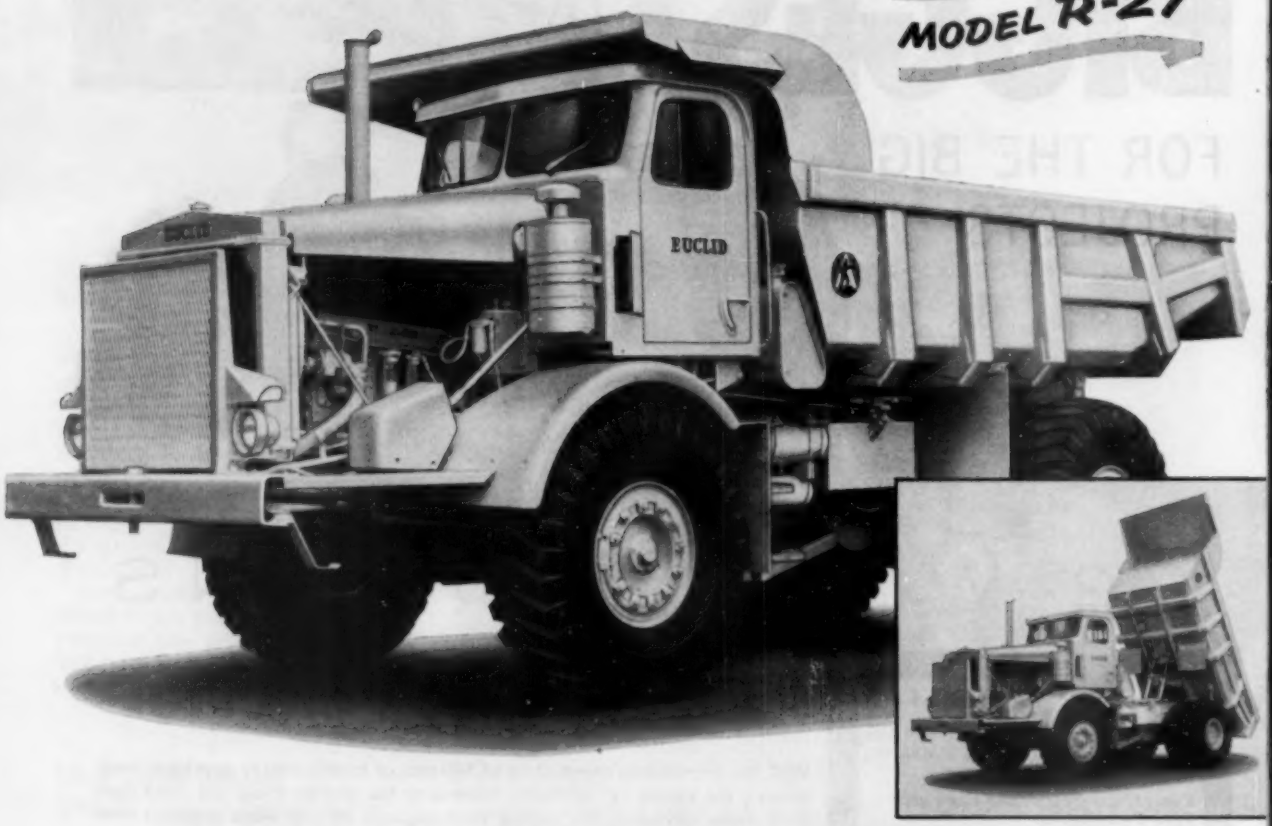
(Many Engineers are writing new specifications calling for more stringent compaction requirements. ESSICK Vibrating Rollers are consistently exceeding these requirements with fewer passes and higher lifts.)

ESSICK MANUFACTURING CO.
1950 SANTA FE AVE., LOS ANGELES 21, CALIF.
850 WOODRUFF LANE, ELIZABETH, NEW JERSEY
affiliated with the T. L. SMITH COMPANY, milwaukee, wisc.

... for more details circle 275 on enclosed return postal card

27 ton "EUC

MODEL R-27



325 or 335 h.p. . . . Torqmatic Drive . . . 18.00 x 25 tires

Model R-27 is a new size in the complete line of Euclid Rear-Dumps—rated payload is 54,000 lbs. This off-highway hauler incorporates the job-proved components which have made Euclid Rear-Dumps the outstanding choice of contractors, mines and quarries.

With either 325 h.p. GM diesel or 335 Cummins engine, the Allison Torqmatic Drive makes maximum use of the power for faster hauling cycles. Converter lock-up in the 4-speed Torqmatic permits 34 mph speed with full payload and efficient performance on long, high speed hauls.

Standard 18.00 x 25 tires on all four wheels assure the traction and load carrying capacity needed for moving 27-ton payloads on tough hauls. Standard body is rated at 18 cu. yds. struck —quarry type body is also available. The R-27 is equipped with oil retarder for safer, more economical braking on jobs with steep down-grades on the loaded haul.

See your Euclid dealer for detailed specifications on this new 27-ton Rear-Dump . . . it's a good example of the advanced design that makes Euclid your best equipment investment.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

REAR-DUMP

It's new...but JOB PROVED!

Big 18.00 x 25 tires on all wheels permit better distribution of payload. Rugged body and frame are designed to withstand loading, hauling and dumping big loads of heavy excavation year in and year out. Quarry body is available for rock work.

Low loading height and good maneuverability of the R-27 increase the efficiency of loading equipment. Exhaust heated body for work with wet, sticky material is optional. Front and rear springs are thrust-mounted and free floating, with variable spring centers.

The R-27 is equipped with dual steering jacks—one for each wheel—and an independent hydraulic system for steering. Oil retarder—an integral part of the Torqmatic Drive—permits faster safe travel speeds down grade and reduce brake maintenance cost.

Large capacity hydraulic pump and twin hoists have ample power to raise and dump the load fast. Mounting brackets for the two stage double acting hoists are an integral part of frame assembly. Comfortable, well insulated cab is offset for maximum visibility.

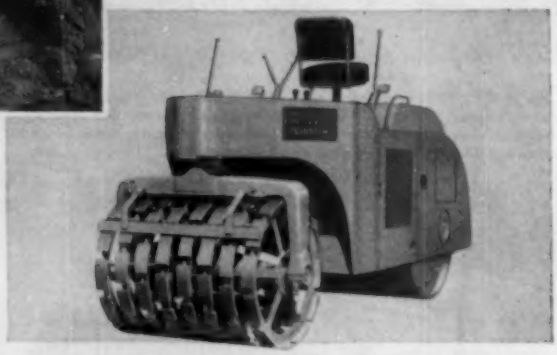
A COMPLETE LINE OF REAR-DUMPS—

10, 15, 18, 22, 27, 40 and 50 ton capacities, also semi-trailer models of 12, 22 and 35 ton payload—to fit any job

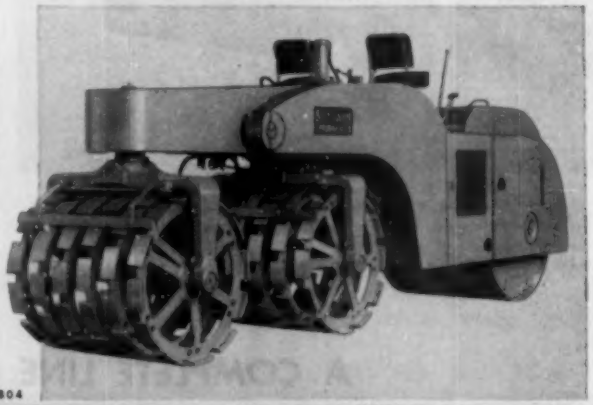
. . . for more details circle 276 on enclosed return postal card

How to get 3 to 7% GREATER COMPACTION DENSITY

With SEGMENTED ROLL you get greater and more uniform densities on earth fills, stabilized base materials, hot and cold-mix bituminous surfaces . . . in fewer passes!



NOW available in 2 sizes for all Buffalo-Springfield® 2-axle and 3-axle tandems . . . any model (from 5-ton metal weight, and up).



Quickly interchangeable . . . readily added to B-S-R rollers now working in the field.

Combining the best compaction benefits of both the projecting lug-type roller, and smooth-faced roll, Buffalo-Springfield 2 and 3-axle tandems offer you a unique method for faster, better compaction on a wide range of materials. Optional segmented roll, mounted in guide-roll position, applies pressure in a flat foot-print pattern . . . and is followed by smooth drive-roll pressure, *all in a single pass.* Result: job-performance tests show 3 to 7% greater compaction densities, as compared with conventional rolling methods.

Segmented roll is faced with staggered rows of heavy steel pads, which operate on an *"interrupted pressure"* principle of compaction. The pads individually enter loose materials with a minimum of displacement sideways or forward . . . then leave the material without disturbing compacted areas. All compaction effort is exerted in a *downward direction.* Segmented roll is, of course, readily interchanged, as your work requires. This is a real time-and-money-saving opportunity worth looking into! Better call your Buffalo-Springfield distributor about this right away.

9804

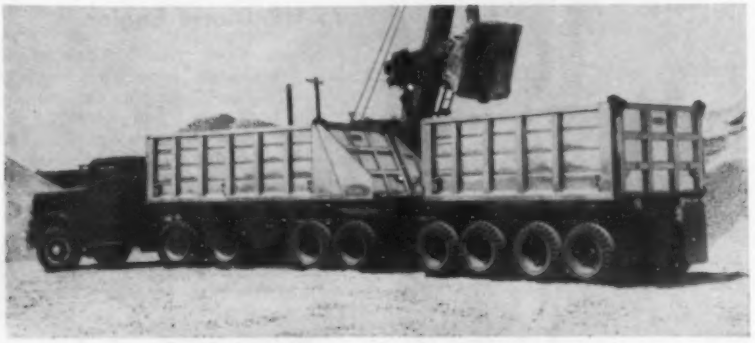
BUFFALO-SPRINGFIELD ROLLER CO.

SPRINGFIELD, OHIO • DIVISION OF KOEHRING COMPANY

. . . for more details circle 248 on enclosed return postal card

New Products

Reader Service Numbers on Enclosed Postcard
More products beginning on page 133



One of the Daybrook Aggregate-Hauling Trains

New Aluminum-Bodied Hauling Trains

Here pictured is one of a fleet of twelve Daybrook trailer trains recently put into an aggregate-hauling service. Featuring aluminum dump bodies, these trains were designed for maximum payload, all the factors, including materials and load weight distribution being utilized to provide an average "bonus payload" which is said to reach 10,000 lb. of aggregate per train as compared with previous equipment used.

Dump body side walls, tail gate, understructure beams and longitudinals are made from aluminum. The body has many features of the Daybrook contractor-style body including box-type side braces and safety-style sloping running boards. Hoist equipment includes Daybrook Series 4D twin telescopic hoists for the truck trailer and a Series 3C telescopic hoist for the pull trailer.

Daybrook Hydraulic Division, Young Spring & Wire Corp., Bowling Green, Ohio.

For more details circle 101 on Enclosed Return Postal Card.

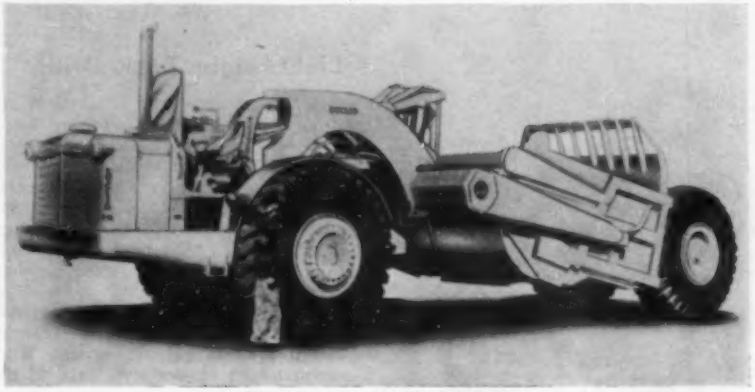
Greater Scraper Capacity

Euclid Division of General Motors Corporation announces an increase in struck capacity from 18 to 21 cu yd for Model S-18 scraper. Heaped load is 24 cu yd at 3:1 and 30 yards at 1:1 slope. The new scraper bowl has a 4-section reversible and adjustable cutting edge and roll-out ejector. All scraper operations—bowl, apron and ejector—are controlled by hydraulic level action.

Power train of the new S-18 tractor includes a 325 hp engine and a 4-speed "Torqumatic" drive with converter lock-up which provides better gradeability and faster travel speeds for a given grade. "NoSpin" differential is available as optional equipment.

Euclid Division, General Motors Corp., Cleveland 17, Ohio.

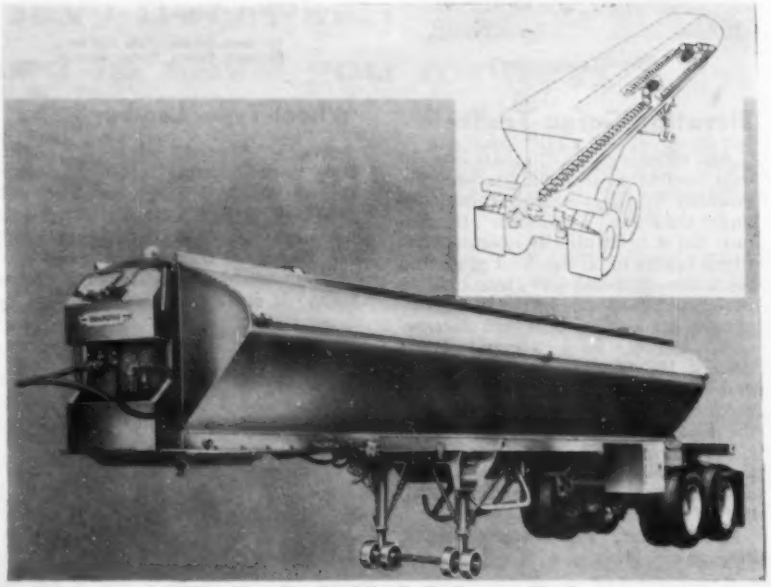
For more details circle 102 on Enclosed Return Postal Card.



The New Euclid Model S-18

Bulk Cement Hauler

The bulk cement tank trailer here shown has a completely variable, hydraulically-powered discharge system, with a two-stage step-down, continuous-contour de-



The New Trailmobile Bulk Cement Hauler

sign for a lighter vessel that both contains and supports the load. The new discharge retains the advantages of the two-stage step-down design, and offers hydraulic control plus a third screw. Independent control of each screw in either direction permits freeing of screws if they become loadbound during the discharge operation. This arrangement allows for optional center discharge.

The two forward screws can be operated independently of the rear screw. The hydraulic motors can be driven either from the hydraulic pump of the tractor or by a self-contained gasoline engine. Specially designed baffles impart truss-like support to the tank shell, resist road shocks, keep cargo weight distributed evenly, and prevent the load from surging. A 25-hp, air-cooled engine is optional for self-contained hydraulic drive.

Trailmobile, Inc., 31st & Robertson Ave., Cincinnati 9, Ohio.

For more details circle 103 on Enclosed Return Postal Card.

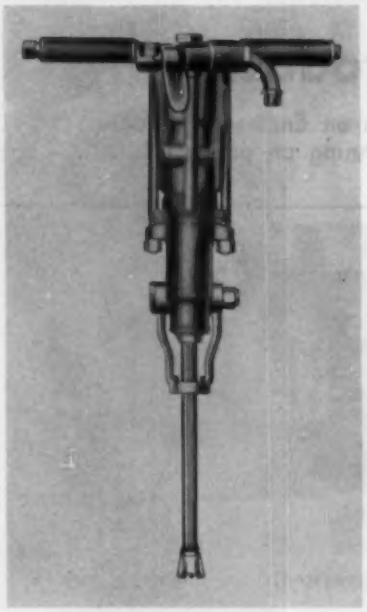
The "Trailevator"

Elevating Cargo Trailer

An elevating trailer that lifts its own load in 40 seconds, has been announced by Magline Inc. Introduced under the name "Trailevator", the new unit has a hydraulically operated bed which lowers to receive load at ground level, then lifts and locks into hauling position. A load-leveling device to compensate for non-uniform load distribution, assures level elevation and descent. Independent wheel suspension and dual leaf-type springs provide shock-free hauling. The tailgate forms the loading ramp as well as the box closure. The trailer need not be detached from towing vehicle for loading or unloading. Rated capacity is 2000 lb, weight of the unit is 960 lb.

Magline Inc., Trailevator Division, Pinconning, Mich.

For more details circle 104 on Enclosed Return Postal Card.



J-30A Jackhammer

Lightweight Rock Drill

A new lightweight rock drill, the J-30A "Jackhammer," has been introduced for applications where a powerful but easy-to-handle drill is needed.

The blower valve is incorporated into the throttle valve for operating ease and convenience. By merely turning the throttle to its rearmost position, the operator directs air under full line pressure through the drill rod and bit to instantly clean the hole of all cuttings. The J-30A multiple-use backhead design permits easy conversion from the standard blower style drill to the plain dry or wet styles.

Ingersoll-Rand, 11 Broadway, New York 4, New York.

For more details circle 105 on Enclosed Return Postal Card.

Wheel-Type Loader

A new low-priced wheel-type loader with power-boosting torque converter drive, the Case "420," has been announced by J. I. Case Co. The unit has shuttle transmission, power steering, cushioned reversible seat and cast iron counterweight as standard equipment. It is said to develop 4600 lb breakout force. The bucket is 63¾ in. wide with 25 deg. rollback and full 90 deg. forward roll at ground level. The exclusive self-leveling device eliminates spillage, as it prevents the bucket from tipping backward when raised.

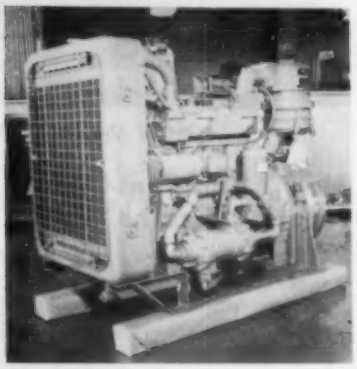
J. I. Case Co., Racine, Wisc.

For more details circle 106 on Enclosed Return Postal Card.

Case "420" Loader

75-HP Diesel Engine

A new diesel engine, the 4-cylinder D311 (Series H) announced by Caterpillar Tractor Co. Engine Division, has a 4-in. bore and a 5-in. stroke. It is a 4-cycle, naturally aspirated, valve-in-head model, and employs the same precombination chamber type design used on all Cat diesels.



D311 (Series H) Diesel Engine, Equipped with Engine Starting Radiator Torque Converter, Clutch and Glow Plug Starting Aids. It is ready to set in ½-yd Excavator

The 252-cu. in. displacement engine develops 75 hp at 2400 rpm. It has an intermittent output rating of 68 hp and a continuous rating of 50 hp at 2000 rpm. The generator for use with this engine has a 30-kw continuous rating. A turbocharger which will soon be available will considerably increase all the above ratings.

This engine is another in Caterpillar's trend to produce new, more powerful models with smaller dimensions than the engines they replace in Caterpillar's line of diesels. In replacing the Cat D311, (Series H) maximum output capacity has increased 10 hp, or more than 15%. Size has been so reduced that it is 9 in shorter, 17 in lower and weighs 350 lbs. less than the D311.

Caterpillar Tractor Co., Peoria, Ill.

For more details circle 107 on Enclosed Return Postal Card.

Herbicide Limits Drift

A new product promising effective roadside weed and brush control, while cutting the spray drift hazard to a minimum, has been placed on the market by The Dow Chemical Company. The new material is called

(Continued on page 112)

Dump body mounted on Dodge 900 chassis with Custom cab.

Dodge Heavy-Duty Finance Plan is designed to save you money!

Need a new truck, but need to watch your working capital, too? The Dodge retail finance plan for heavy-duty trucks was designed for just that situation. It lets you operate modern, efficient trucks without burdening yourself with excessive finance charges.

Designed with the same understanding of truck problems that has made Dodge *Power Giants* outstanding, the Dodge Heavy-Duty Retail Finance Plan is tailored to your needs. Whether you need one truck or several, you can finance your purchase with a minimum down payment, and with lowest financing cost. Payments can be arranged over an extended period.

What kind of equipment can be financed with this plan? Any Dodge medium-duty, heavy-duty (400 through 900 models) or four-wheel-drive trucks, plus extra equipment, including bodies mounted on the trucks.

This new plan makes it both easy and economical for you to get *Power-Giant* advantages: exclusive Power-Dome V-8 engines that keep maintenance at a minimum . . . rugged "Job-Rated" construction . . . famous Dodge economy and dependability . . . advanced Dodge styling.

Let your Dodge truck dealer show you how this Heavy-Duty Retail Finance Plan helps truck operators with established credit own thrifty new Dodge *Power Giants*. See your dealer soon.

DODGE *Power Giants*

. . . for more details circle 256 on enclosed return postal card

Mack 6-wheel dumpers pace the pavers on road-surfacing job. Used for a variety of heavy on- and off-highway hauling chores, these trucks, as well as Armour's other Macks, have set new performance records with . . .

down time less than

"Our contracts require us to take on all kinds of jobs, ranging from rock hauling to road surfacing to transfer of iron ore from ship to shore—and we require versatile trucks that enable us to complete these jobs swiftly and dependably.

"They're all tough requirements, but our 16 Macks have the stamina to handle these jobs . . . and they do it economically, with minimum maintenance, and less than one per cent down time," says Mr. John M. Reid, Treasurer, of Armour Excavating, Inc., of Philadelphia.

Armour is especially pleased with Mack's 20-speed transmission because it's built to give the best performance under all driving conditions, from city street to tough off-highway low-speed hauling.

Macks have what you need for dependable, profitable operation in on- or off-highway construction—maneuverability and ease of handling for fast spot

Another of Armour's Macks dumping asphalt paving material. The combination of Mack's Balanced Bogie with Power Divider and the 20-speed transmission makes these trucks unexcelled for the roughest off-highway hauling, yet gives them the flexibility needed for open road operation.

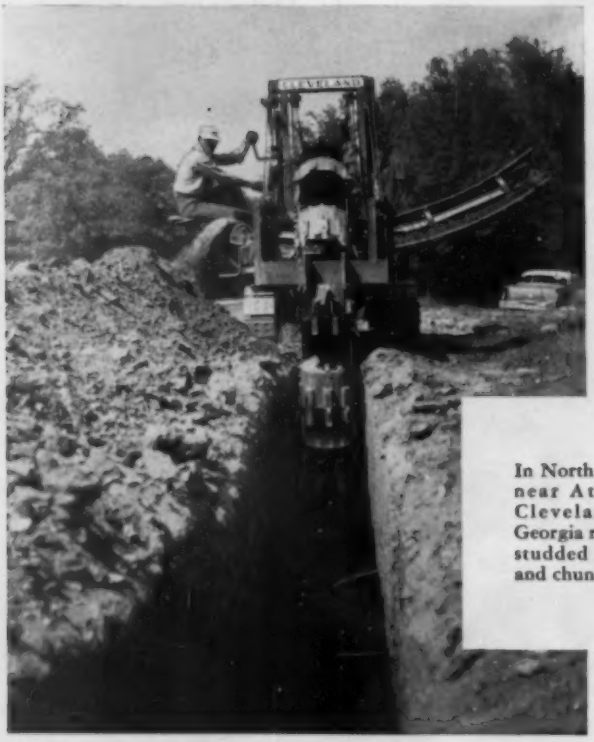
one percent

ting and dumping; the ability to haul maximum payloads with low operating costs; and only routine maintenance requirements—sensible reasons why you can't afford *not* to operate Macks!

Your nearest Mack branch or distributor will be glad to give you on-the-job performance figures and the names of Mack users near you. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

. . . for more details circle 298 on enclosed return postal card



In North Druid Hills near Atlanta, this Cleveland 95 digs Georgia red clay, often studded with quartz and chunks of granite.

nine Clevelands . . . never a failure in the field

"We have used Clevelands ever since 1946, when our company was organized," says C. V. Lanier, field superintendent for the Concrete Construction Co. of Atlanta, Ga., "and currently we are operating nine. Mechanically, we have never had a Cleveland halt in the field.

"We have encountered every sort of obstacle and have trenched through blue granite rock, sand rock, shale, stumps, on flat land and hilly, through all types of weather. Our Clevelands have been economical to operate, easy to maintain mechanically, adaptable to every terrain and simple to handle."

There's nothing like a Cleveland for trenching . . . accurate . . . fast . . . dependable . . . clean.

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere

. . . for more details circle 259 on enclosed return postal card

New Products

(Continued from page 108)

"Inverton 245"—a 2, 4, 5-T product formulated in an invert emulsion. The invert emulsion is a dispersion of oil particles in water, the reverse of a standard emulsion. It gives the spray mixture a thick, creamy consistency which is responsible for most of the unusual properties of the new product.

"Inverton 245" is sprayed on vegetation in large particles and does not break into a mist. This reduces the possibility of damage to nearby crops from spray drift. The thick consistency of Inverton 245 causes it to cling tightly to branches and foliage. This permits spray crews to work during wet weather when conventional herbicides cannot be used. Standard spray equipment is practical for applying "Inverton 245" compounds.

The Dow Chemical Co., Midland, Mich.

For more details circle 108 on Enclosed Return Postal Card.

The "Flygt" Pump

Drainage and Sump Pumps

Designed to operate in shallow, dirty water without danger of damage from running dry, or for equally safe and efficient use when fully submerged, the "Flygt" electric powered centrifugal pump is offered by its Swedish makers for service in the mining and construction fields.

Capacities range from 50 to 2250 Imperial gallons per minute and heads up to 220 feet per pump (in the larger sizes). Power is from 1½ to 65 hp. No priming is needed. The completely waterproof motors operate on 3-phase, 60-cycle current, with the smallest of the series adapted also to single-phase operation.

Many advantages are claimed, including low cost, fully automatic operation (it is said that one operator

can care for as many as fifty pumps in continuous operation) long life and low maintenance cost, freedom from clogging, immunity to frost damage, proof against shock, and absence of suction hose or foot valves—all contributing to economical pumping.

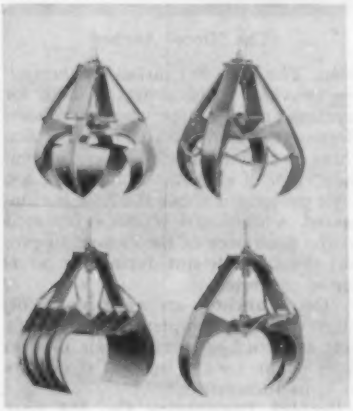
Stenberg Corporation AB, Duvedsvagen 17, Stockholm-Vallingby 1, Sweden. Sales and service in America are by Stanco Mfgs. & Sales, Inc., Santa Monica, Calif.; Stenberg Manufacturing Corp., Hoosick Falls, N.Y.; and Stenberg Corporation of Canada, Ltd., Montreal, P.Q.

For more details circle 109 on Enclosed Return Postal Card.

Grapples & Orange Peels

Erie Strayer Co. has added grabs, grapples and orange peel buckets to its well known line of clamshells. The new series is designed for handling logs, stumps, rock, riprap, boulders, pulpwood, scrap metal and other hard-to-handle materials. Any crane equipped for clamshell buckets can handle these new items.

Erie Strayer Co., Dept. NR-68, Rudolph Ave. & NKP RR, Erie, Pa.

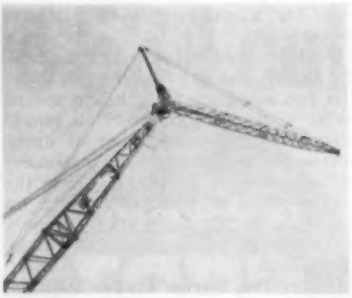


Erie's New 4-Leaf Orange Peel, 4-Tine Grapple, Stacked Wood Grab, and Log-Pole-Stone Grab

For more details circle 110 on Enclosed Return Postal Card.

High Capacity Jib

A completely new style jib is now available for Link-Belt Speeder's K-500 and K-600 series cranes (1½ to 3-yd., 26.6 to 75-ton size range). The basic two-piece 20-ft. jib has a maximum capacity of 10 tons. By means of 10-ft. sections, it can be extended to a 30 or 40-ft. length. Greater capacities are made possible through use of high-strength alloy steel construction which gives increased strength-to-weight ratio. Other advantages include the jib peak sheave and strut deflector sheaves mounted on needle bearings. Dead end cable anchor on jib peak permits use of two-part whipline. Equalizer sheaves on the jib strut, together with



Link-Belt Speeder Jib

turnbuckles for boom and jib guy lines, allow fast, easy change in jib angles. Extender cables are furnished with jib extensions to facilitate fast changes in jib length.

Link-Belt Speeder Corporation, Cedar Rapids, Iowa.

For more details circle 111 on Enclosed Return Postal Card.

Allis-Chalmers Companion Equipment

Through its new Utility Tractor and Equipment Sales Department, Allis-Chalmers is working closely with selected independent manufacturers of companion equipment for "Utility" tractors, Models D-14 and D-17. When A-C engineering clearance is given to companion equipment, a statement of such "clearance" may be used by its manufacturer in literature and promotional material, as follows:

CLEARED BY ALLIS-CHALMERS

The mounting and operation of this equipment will not affect the tractor warranty extended by ALLIS-CHALMERS. The manufacturer of this equipment is responsible for its performance and warranty.

Allis-Chalmers own line includes disc harrows, coil shank and field cultivators, blades, scoops, tool bars, post hole diggers, subsoilers, and carriers. In addition, Allis-Chalmers makes certain products for light industrial work. Other manufacturers' equipment cleared includes backhoes and loaders, rotary tillers, cutterbar highway mowers and rotary mowers.

Allis-Chalmers Manufacturing Co., Tractor Group, Milwaukee, Wisc.

For more details circle 112 on Enclosed Return Postal Card.

Gasoline Rammer

The "Maxtamp" rammer here shown is a gasoline powered unit featuring a positive carburetor, automatic built-in lubrication system, positive control for safe operation, and high compaction, exerting 311 foot-pounds with each blow, on lifts up to 24 in. The jump is controlled by the operator by means of the ring handle on the top of the machine and by the handle bars. It is stated that the "Maxtamp" can be left

idle for long periods, or can be transported from low to high areas without any adjustments. C. H. Johnson Machinery, Ltd. is the manufacturer. General distributor in the United States is —

Complete Machinery & Equipment Company, Inc., 36-40 Eleventh St., Long Island City 6, N.Y.

For more details circle 113 on Enclosed Return Postal Card.

Heavy-Duty Dumper

The 35-ton payload "CWD-221 Rear Dumper" (here shown with Continental-Wooldridge vice president and general manager Robert Campello receiving Blue Ribbon Equipment Award from Henry G. Grunstedt, manager, engineering services, Mining World magazine) is announced as adaptable to large-scale earthmoving and con-

Designed for Mining—Adapted to Earth Moving — the Continental-Wooldridge No. 221

tracting as well as to the mining services for which it was developed.

Designed for fast operation and use on extreme grades, the unit is powered by a 375-hp General Motors engine. Hauling speeds exceed 30 mph. The dumping angle is 65 degrees, and dumping cycle is listed as 14 seconds.

Continental Copper & Steel Industries, Inc., Wooldridge Division, Sunnyvale, Calif.

For more details circle 114 on Enclosed Return Postal Card.

The "Mobilite"

Flood Light Has Own Power

Pacific Mercury, has just brought out the "Mobilite" trailerized flood lighter that generates its own electric power. Equipped with four floodlight units, it is available with 320,000 or 480,000 candlepower. The light units can be individually adjusted to any desired height up to the maximum 18-foot extension. They pivot in a complete circle.

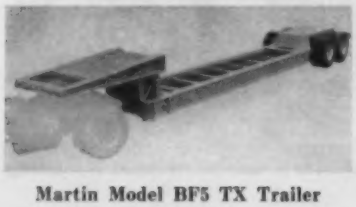
The "Mobilite" was designed to meet emergency needs of nighttime fire-fighting as well as to supply contractors and engineers, park program directors and others with a powerful, easily mobile lighting unit independent of public power sources.

Pacific Mercury, 14052 Burbank Boulevard, Van Nuys, California.

For more details circle 115 on Enclosed Return Postal Card.

35-Ton Gooseneck Trailer

A new beam-type folding gooseneck trailer for hauling tall or top-heavy machinery has been announced by Hyster Co. Designated the "Martin Model BF5AX", this 35-ton capacity unit has a standard 25-ft. platform length.



Martin Model BF5 TX Trailer

With the folding gooseneck lowered, the hauled unit safely and easily straddles two low-slung main beams spaced 60 in. apart. Tracks travel on planks placed alongside the trailer, if necessary, so the underside of the machinery will not drag on the trailer. When the equipment is in position a winch on the truck tractor raises the gooseneck and trailer to the travel position on the fifth wheel.

Hyster Co., Martin Trailer Division, Kewanee, Ill.

For more details circle 116 on Enclosed Return Postal Card.

Extension Drill Steel

Introduction to the American market of easily-coupled and fatigue-resistant 1½ and 2-in. cold rolled alloy extension drill steel has been announced by Atlas Copco. The new round steels are claimed to feature uniform strength and true circular flushing holes. These characteristics are stated to be achieved by cold-rolling the steel from billets.

New Cold Rolled Alloy Extension Drill Steel and Fittings

Made from prime Swedish metal, the new Sandvik Coromant extension steels are rope-threaded—two threads to the inch—to assure ease in both coupling and uncoupling operations even after sustained drilling. They may be easily re-threaded on ordinary metal lathes without heat treatment.

Atlas Copco Eastern, Paramus, N.J., Atlas Copco Pacific, San Carlos, Calif.

For more details circle 117 on Enclosed Return Postal Card.

Improved Anchor Fitting

Here shown is the new "Deco" anchor for attachment of columns, machines, or other objects to concrete. The box-like fitting attached to the top of the anchor bolt contains an oblong nut, movable in all directions sufficiently to compensate for the usual error in setting anchor bolts. The use of a stud of the desired length, eliminates the necessity of hoisting and lowering the object over a fixed bolt by the trial and error method.

The bolt is centered in the fitting when attaching to setting templates, and is said to be no more difficult to install than conventional type anchor

The "Deco" Anchor

bolts. The large flat surface of the casting provides an ideal arrangement for leveling and doweling where necessary. Because the stud for attaching the machine or column is removable, the common error of allowing too much or too little projection above the floor is eliminated. A temporary washer is centered in the flush area of the casting to protect the movable nut during the pouring of concrete.

"Deco" anchors are available as fittings only or complete with anchor bolt and stud to specifications in sizes from ⅜ in. to 1½ in. bolt diameters in ⅛ in. increments.

Decatur Engineering Co., 519 East William St., Decatur, Ill.

For more details circle 118 on Enclosed Return Postal Card.

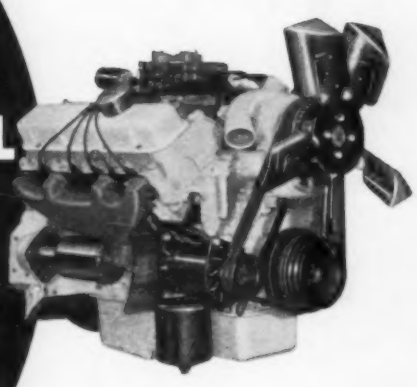
Survey Cost Cutter

Distance measurements of 20 miles or more in less than one hour, with a crew of two men and equipment weighing 68 lb (exclusive of an 80-watt generator) are now practical with the "Geodimeter", an instrument operating by light measurement with special electronic equipment. Not less striking is the accuracy attained—an error ratio of 1/16,000 at one mile and 1/190,000 at 20 miles. The mean error for a single observation is 4 inches plus or minus 2 one-millionths of the distance. Angles are measured by theodolite, as heretofore. The above figures are for Model 3. Model 4, weighing considerably less and having a mean error of 1¼ inches plus or minus 2

(Continued on page 117)

From 134 to 534 cubic inches...

there's a **FORD INDUSTRIAL ENGINE** to meet your every power need!



Whether you farm . . . drill for oil . . . build highways . . . or manufacture, there's a Ford Industrial Engine that can make your operation even more efficient and more profitable.

Take Ford's new Super Heavy Duty V-8's. Built to handle the big jobs easier at less cost, they have new *fully machined* combustion chambers . . . new fuel induction systems . . . new lubrication systems . . . and provide more horsepower per pound of engine weight than ever before possible.

These are typical of the many engineering advances you'll find in all Ford Industrial Engines. If you're considering new power or repowering, it'll pay you to check Ford's full line of 4-, 6- and V-8 cylinder engines . . . including the Ford 220-cu. in. and 330-cu. in. Diesels. Most models are available as engine assemblies or power units, foot- or skid-mounted.

Ford

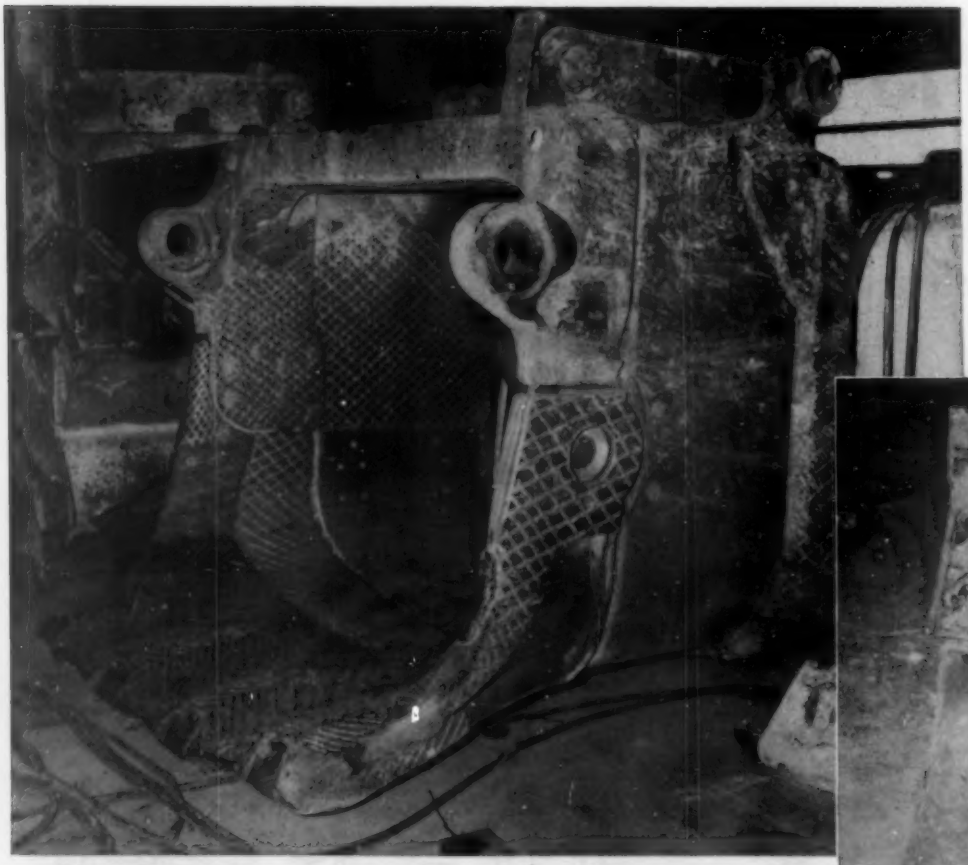
INDUSTRIAL ENGINES AND POWER UNITS

Write or phone today for complete information:

INDUSTRIAL ENGINE DEPARTMENT

FORD Division of FORD MOTOR COMPANY, P. O. BOX 598, DEARBORN, MICHIGAN

. . . for more details circle 271 on enclosed return postal card



BUCKET FRONTS, SIDES, BOTTOMS AND LIPS *are naturals for Semi-Automatic Hard-Facing. The large surfaces are covered faster and can be quickly touched up during short periods of downtime. Stoody 100, applied in various patterns, gives economical wear life.*

BUCKET TEETH AND ADAPTERS *are hard-faced with Stoody 100. Usually, stringer beads are applied counter to direction of material flow, with more effective wear resistance.*

Better wear protection, faster application on shovel parts with STOODY SEMI-AUTOMATIC HARD-FACING!

Hard-facing jobs that used to take hours can now be done in minutes. These tremendous time-savings are the result of Stoody Semi-Automatic Hard-Facing... a process that puts down 2 to 4 times more hard metal per hour than is possible by manual welding. Here's a way not only to cut maintenance costs, but to simultaneously lighten work loads on welding crews... provide more time to finish work that normally piles up—or never gets done!

With Stoody's *complete line of alloys* in wire form for semi-automatic hard-facing, *an exact choice best suited for each wear problem is available.* Get the full facts on Stoody Semi-Automatic Wires and see how you can cut welding time, simplify maintenance and still obtain the same high wear resistance available in other Stoody Alloys.

TEST STOODY SEMI-AUTOMATIC HARD-FACING IN YOUR OWN PLANT—Arrange now for a personal demonstration with any Stoody Distributor. Check the Yellow Pages of your phone book or write direct.

STOODY COMPANY

11908 East Slauson Avenue
Whittier, California

. . . for more details circle 313 on enclosed return postal card

New Products

(Continued from page 114)

one-millionths of the distance will be brought out soon at a price expected to be well under that of the earlier model.

In operation, a light beam is projected from the "Geodimeter" at one end of the line to a reflector at the other, and the distance is determined directly by dial settings on the return ray. Separate reflectors may be used for foresights and backsights, and as many as needed for side shots. Advantages of a method of this sort in rough terrain or across obstructed areas are obviously tremendous; and for level, unobstructed terrain the cost savings are reported as still great.

The California Division of Highways, which purchased a Model 3 in September, 1957, reports that they have had no trouble in training competent operators. They add that the instrument stands rather rough handling and that maintenance costs, other than replacing an occasional projector lamp, have been negligible. The instrument is made in Sweden by Svenska AB Gasaccumulator of Stockholm-Lidingo. In the United States it is sold and serviced by—

Berg, Hedstrom & Co., Inc., 1170 Broadway, New York 1, N.Y.

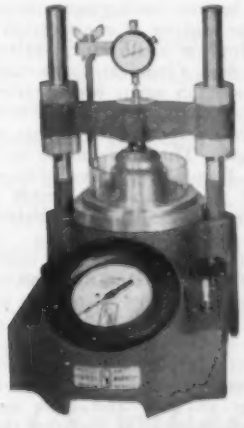
For more details circle 119 on Enclosed Return Postal Card.

Soil Testing Machine

A new line of K-W Conbel consolidation soil testing machines has been announced by Tinius Olsen Testing Machine Co. Occupying less than 1½ sq ft of table space, these air operated machines completely eliminate the use of dead weight. Load increments are applied instantly to the soil sample without impact, and can be maintained indefinitely. The amount of soil settlement is shown by a dial indicator attached to the consolidometer.

Tinius Olsen Testing Machine Co. 748 Easton Road, Willow Grove, Pa.

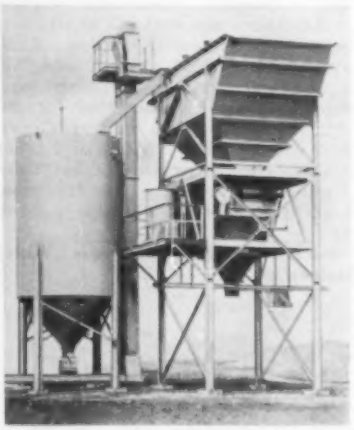
For more details circle 120 on Enclosed Return Postal Card.



K-W Conbel Testing Machine

Batching Plants

A new Heltzel unitized combination batching plant sets up faster and handles both batch trucks and truck mixers. Plant is factory-assembled in easy-to-handle sections and is available in 100 and 125-ton capacities.



New Heltzel Unitized Combination Batching Plant

The plant is comprised of the bin section, an intermediate operating section and the substructure. The bin section comes complete in itself with simple attachments for connecting to the operating section. The operating section includes scales and batchers that are factory-assembled and tested. This section fastens easily onto the substructure with but four simple fittings.

The Heltzel Steel Form & Iron Co., Warren, Ohio.

For more details circle 121 on Enclosed Return Postal Card.

Tire Service Truck and Crane

B. F. Goodrich Tire dealers are now servicing contractors with the 15,000-lb. (gvw) truck here shown. The truck is equipped with the latest air-powered tools and is designed to handle all the tire needs—both large and small—of the national road program.

The pneumatically-operated crane lifts tires weighing more than 3 tons, has a 360-degree free swing, loads from side and back, and requires only 18 sq. in. mounting space. Control is by hand at the crane itself or at a distance. Designation is the "Akron Airdraulic Crane;" the manufacturer is Thiele Body Company, Johnstown, Pa.

The B. F. Goodrich Company, Akron, Ohio.

The Goodrich Tire Service Truck

For more details circle 122 on Enclosed Return Postal Card.

Parking Lot Signs

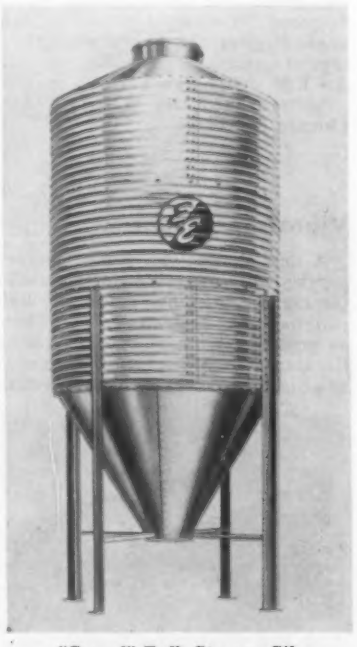
A special program of signs for off-street parking lots has been designed by U.S. Porcelain Enamel Co. Included are traffic directional, identification and on-lot control signs. Many of these vitreous porcelain on steel signs are carried in stock ready for immediate shipment in standard styles and sizes and a variety of colors. The company also offers the services of their art staff for designing specialized signs whenever needed.

U.S. Porcelain Enamel Co., 4731 E. 52nd Drive, Los Angeles 52, Calif.

For more details circle 123 on Enclosed Return Postal Card.

Bulk Storage Silos

A new low-cost "Corgal" line of bulk storage silos, announced by Engineers Equipment, Inc., is designed to effect



"Corgal" Bulk Storage Silo

more economical and efficient handling of bulk cement and free-flowing dry granular materials. These silos are constructed of prefabricated corrugated galvanized steel. Vertical seams are double bolted to assure maximum strength and weather-tight protection. Steep 60-degree discharge cone insures fast, easy flow of material. They are available in 6, 9 and 12-ft. diameters with capacities of 29 to 413 bbl.

Engineered Equipment, Inc., Waterloo, Ia.

For more details circle 124 on Enclosed Return Postal Card.

Soiltest Model CT-700A Cement Tester

Briquette Tester

A new cement briquette tester, CT-700-A; was part of the exhibit of Soiltest, Inc., at the 61st meeting of The American Society for Testing Materials, June 23-27. It applies loads at a constant rate to specimens held in the jaws. The failure point of the briquette, in terms of pounds of load applied, gives the tensile strength of cement mortar according to the A.S.T.M. designation C-190.

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Illinois.

For more details circle 125 on Enclosed Return Postal Card.

Vibrating Feeder

A new straightline, geared counterweight, vibrating feeder for controlled feeding of a wide range of bulk materials at high rates has been announced by Link-Belt Company. Capable of absorbing great impacts, the new unit can be mounted directly under a hopper or bin to feed, convey, pick or scalp high tonnages of materials, including lumps up to 36 in. in diameter. A geared eccentric shaft mechanism produces a high intensity strightline stroke that ranges in amplitude from ¼ to ½ in. up to 900 rpm.

Link-Belt Co., Prudential Plaza, Chicago 1, Ill.

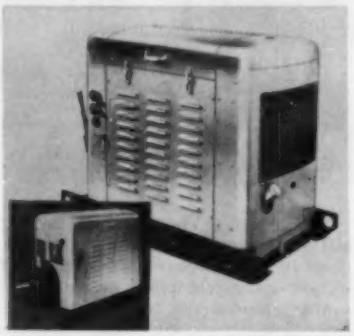
Link-Belt Straightline Geared Counterweight Vibrating Feeder

For more details circle 126 on Enclosed Return Postal Card.

Heavy-Duty Power Unit

The new heavy-duty "Jeep" 6-cylinder engine has been incorporated into a complete power unit package, skid-mounted and enclosed in an easily accessible sheet metal housing. Radiator, muffler, 8.6 gal. gasoline tank, No. 4 SAE bell housing, and other basic accessories are all assembled for immediate operation on delivery. Governor, industrial type wheel, and other optional equipment is available. Piston displacement is 226 cu. in. Maximum brake horsepower is 92 at 4000 rpm and 82 at 2600 rpm.

Industrial Engine Department, Willys Motors Inc., Toledo, Ohio.



Willys Power Unit Package

For more details circle 127 on Enclosed Return Postal Card.

New Tire for Rough Use

A new nylon truck tire has been introduced by Goodyear for use in mining, logging, construction and industrial sites and in other areas where sharp puncturing objects are a hazard. Two criss-crossed steel cord breaker strips are built into the tire beneath the tread to protect an area considered most vulnerable to punctures. Combined with triple-tempered 3-T nylon cord, the protective steel shield is stated to give truck owners a low cost-per-mile tire for rugged use.

Named the "Nylon Steel Guard," the tire is available in the "Road Lug" tread design, sizes 8.25-20 through 12.00-24. Also available are three sizes of "Hard Rock Steel Guard Nylon" tires—11.00-22, Lug 14, 12.00-24, Lug 16, and 12.00-24, Rib 16.

The Goodyear Tire & Rubber Co., Akron 16, Ohio.

For more details circle 128 on Enclosed Return Postal Card.

New Page Bucket. Dotted Line Shows Added Capacity

Sand and Gravel Bucket

A new line of automatic dragline buckets designed specifically for the sand, gravel and quarrying fields, announced by Page Engineering Co., features a longer and higher basket, stated to carry out more pay load on every swing. To utilize the advantages of this basket, the new buckets use a shorter dump rope that throws the front of the bucket sharply back when hoisting to prevent spillage of material. The bucket is stated to be extremely advantageous in underwater digging, where the material has a natural tendency to flow with the water in a direct line from the rear top of the basket to the lip.

Page Engineering Co., Clearing Post Office, Chicago 38, Ill.

For more details circle 129 on Enclosed Return Postal Card.

For Concrete Bonding

To expose the aggregate in concrete for the making of construction joints, bonding, or architectural surface texture, Sika Chemical Corporation has produced an agent which retards surface set to permit removal of mortar but does not inhibit ultimate set and strength. The trade name is "Rugasol." Two types are available—one for direct application to freshly placed plastic concrete, and the other for advance use on forms.

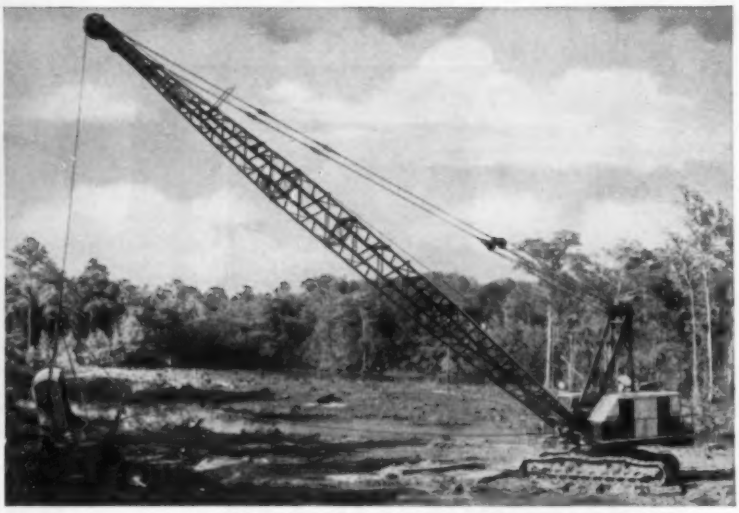
The depth of retarded mortar depends upon the thickness and strength of the application. Usually it is about ⅛ in. Removal is by brushing or with a jet of water from 12 to 24 hours after concrete is placed. It is stated that "Rugasol-retarded" mortar will harden within 28 days and have excellent strength by 90 days, and that there are

(Continued on page 121)

From Colorado to the Carolinas . . .

Owners get more time for OUTPUT with Bucyrus-Eries . . . You Can, Too

On a highway resurfacing job near Silver Plume, Colorado, a 1½-cu. yd. Bucyrus-Erie 38-B dragline feeds a portable crusher plant. Owner: Northwestern Engineering Co., Denver.



In South Carolina, Atlantic Dredging Company of Manning has no trouble keeping work on schedule with this Bucyrus-Erie 71-B dragline. The job: relocating Waccamaw River near Conway to permit construction of a state highway.

For years Bucyrus-Erie draglines have provided top performance on highway, road, and street construction jobs throughout the country. With a Bucyrus-Erie dragline, you get more working time each hour of every shift — more daily output — because:

It's built tough. Parts are simple, large, few in number — there is little that can go wrong. It stays on the job. Machinery is arranged simply, compactly so that maintenance can be handled quickly with little downtime. It's easy to keep a Bucyrus-Erie going at top capacity. Exceptional synchronization of speeds and power assures smooth, well balanced work cycles . . . fast, responsive control.

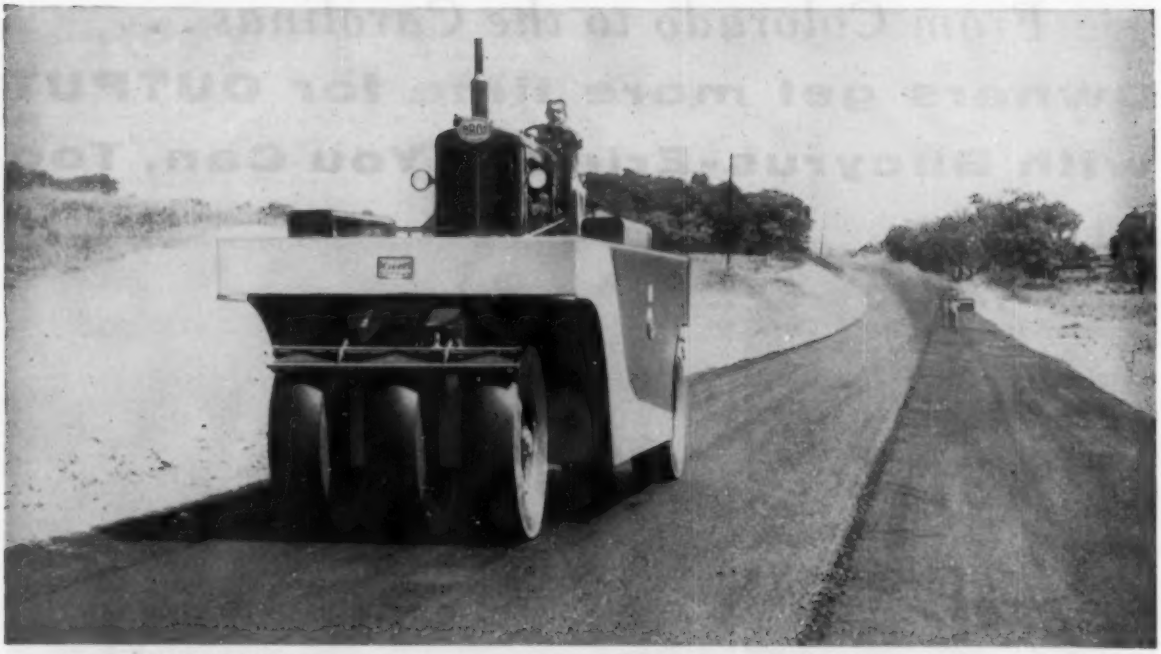
Why not join the growing list of owners who have profited from Bucyrus-Erie draglines. Your nearby Bucyrus-Erie distributor will gladly help you select the right size of machine — ranging from ⅜ to 4 cubic yards — for your requirements. 469E58

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WIS.

DESIGNED FOR YOU! *You can count on bonus output ability from your dragline when the boom carries a Bucyrus-Erie New-Design bucket. It's engineered for fast, full loading, clean dumping. Bucyrus-Erie buckets are made of BECOLOY — a steel alloy developed by Bucyrus-Erie especially for dragline buckets. This 1½-cu. yd. bucket is caught in action on a road job in Toledo, Ohio — on a 30-B owned by Schoen Asphalt Paving Co.*

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

. . . for more details circle 247 on enclosed return postal card



Front wheels of BROS SP-730 roller oscillate as a unit, rear wheels oscillate in pairs to accomplish *uniform consolidation by kneading*. Far greater compactive forces are exerted than would be expected under normal traffic. Finished mat has enough *immediate* stability to withstand effects of modern traffic and yet has maintained enough voids to provide flexibility.

New BROS SP-730 (30-TON) PNEUMATIC ROLLER—

Achieves Maximum Consolidation of Flexible Pavements

● In a search for better compaction of asphaltic mats, the State of Ohio adopted specifications in 1956 for a *self-propelled rubber-tired roller* capable of wheel loads and contact pressures above the maximum produced by legally loaded trucks.

One such roller which met the new specifications was tested in 1957 to determine if it would consolidate a newly laid asphaltic concrete mat to the extent that the finished pavement would be stable under modern heavy traffic and still have enough flexibility to respond to any subsequent subpavement movement.

It was a BROS Model SP-730 (Self-Propelled, 7 Rubber-Tired Wheels, 30 Tons Maximum Weight) with three wheels forward and four wheels in the rear. Construction of the mat in no way varied from standard methods except that the BROS rubber-tired roller was used in place of the steel tandem roller usually operated behind the initial roller.

The BROS roller was used on a project in Licking County to construct a three inch asphaltic concrete binder course over a base of five inches of waterbound macadam on an eight inch granular subbase.

IN-PLACE DENSITY TESTS ON THE COMPLETED MAT, CONDUCTED BY THE OHIO STATE HIGHWAY DEPARTMENT, SHOWED AN AVERAGE VOID CONTENT OF 4.01% AND AN AVERAGE DENSITY OF 100.99%! VARIATIONS IN DENSITY AND IN VOID WERE, FOR ALL PRACTICAL PURPOSES, ELIMINATED. (SEE TABLE.) AND, WHAT'S MORE, DESIGN DENSITY WAS ACCOMPLISHED BY ONLY ONE PASS OF THE ROLLER!

Results of this test *and* of a second test on a similar project in Clermont County (which showed an average void content of 3.71% and an average density of 101.28%) are now available on request.

Can your state afford *not* to get asphalt mat compaction results similar to those described? Send for the complete report today. You'll be on your way with *initial* compaction that's final . . . to greater, longer-lasting pavement stability *than has ever before been possible!*

SP-730 RESULTS ON THE COMPACTION OF ASPHALTIC CONCRETE LICKING COUNTY, OHIO

Percent Voids	Percent of Design Density	Position in Cross Section (From C)
4.40	100.60	10 ft. lt.
4.90	100.10	4 ft. lt.
5.08	99.92	on c
2.73	102.27	4 ft. rt.
2.34	102.66	10 ft. rt.
4.69	100.31	10 ft. lt.
3.02	101.98	4 ft. lt.
3.93	101.07	on c
4.40	100.60	4 ft. rt.
4.11	100.89	10 ft. rt.
2.13	102.87	10 ft. lt.
4.58	100.42	4 ft. lt.
6.18	98.82	on c
4.14	100.86	4 ft. rt.
3.54	101.46	10 ft. rt.
4.01	100.99	AVERAGE

BROS

BROS *Incorporated*

ROAD MACHINERY DIVISION

1057 TENTH AVE. S.E.
MINNEAPOLIS 14, MINN.

Write today for the full report on the Ohio tests and for complete new literature describing the new BROS SP-730 pneumatic roller. It's free of cost or obligation!

SHEEPSFOOT TAMPERS

STEAM GENERATOR

BITUMINOUS CIRCULATOR

VIBRA-PACTOR

9-TON SELF-PROPELLED ROLLER

9 AND 13-TON ROLLERS

. . . for more details circle 245 on enclosed return postal card

New Products

(Continued from page 118)

none of the objectionable effects of acid etching. Results are said to be superior to those by chipping, cracking, or sand blasting, and the cost considerably less.

Sika Chemical Corporation, 35 Gregory Ave., Passaic, N.J.

For more details circle 130 on Enclosed Return Postal Card.

Soiltest Model CT-713 Concrete Testing Machine

Portable Concrete Tester

A new low-cost portable concrete testing machine, announced by Soiltest, Inc. makes possible rapid on-the-job testing of concrete cylinders up to a total applied load of 200,000 lb. The tester is entirely self-contained and no electrical or pressure connections are required. Loads are developed by a hand-operated pump which actuates the piston of the main hydraulic system. The machine weighs only 400 lb.

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

For more details circle 131 on Enclosed Return Postal Card.

3 Welder Power Plants

Announced by Miller Electric Mfg. Co. are the following gasoline engine-driven welder power units.

The D-250 "Roustabout" which provides either of two dc welding current ranges—75-175 amps or 125-350 amps—and 1 KW of 115v dc auxiliary power available simultaneously, and which will also produce 10 KW of 115/230-volt single phase, 60-cycle ac.

The DA-300 "Big Rig" combination ac-dc welder, plus an ac power plant, plus 1 KW of dc power while welding,

Miller "Four-in-One" DAH-350

designed for metallic arc use. Delivering two welding current ranges in either ac or dc with 1 KW of dc auxiliary power available at the same time-generator output rated at 10 KW of 115/230v. single phase, 60 cycle ac.-welding ranges (dc) 75-175 or 125-350 amps; (ac) 65-160 or 110-400 amps.

The DAH-350 "Fireball" four-in-one model, reported as the only complete unit made to incorporate in one machine an ac-dc welder for (1) metallic arc, or (2) tungsten inert gas welding, plus (3) ac power plant, and (4) 1 KW dc power while welding. Welding ranges in amperes are: (ac metallic) 35-100, 65-160 and 110-400; (ac inert gas) 35-75, 65-160 and 150-375; (dc metallic) 35-80, 75-175 and 125-350; (dc inert gas) 35-100, 85-225 and 170-375. Rated output at 100% duty cycle: 250 amps dc tungsten arc; 300 amps ac tungsten arc. Generator: 10 KW of 115/230v, single phase, 60 cycle ac.

Miller Electric Mfg. Co., Inc., Appleton, Wisc.

For more details circle 132 on Enclosed Return Postal Card.

Telescopic Hoists

A new line of twin-cylinder underbody hoists, the TA and TR series, has been announced by Gar Wood industries, Inc. With capacities ranging from 6½ to 8 tons, these new telescopic hoists feature short stroke design, with only one moving sleeve section. According to Gar Wood, the new hoists provide exceptional stability, even when dumping on rough ground. The lightweight design also is stated to result in greater payloads per trip and lower gasoline consumption.

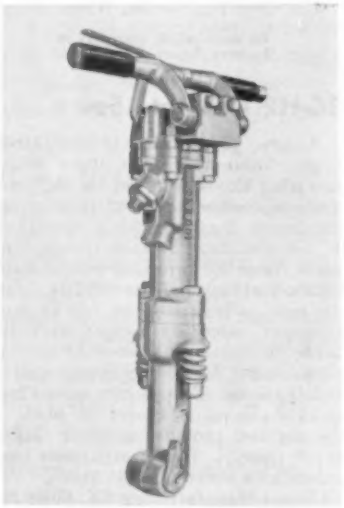
New Gar Wood Hoist

Gar Wood Industries, Inc., Wayne, Michigan.

For more details circle 133 on Enclosed Return Postal Card.

Pavement Breaker

A new medium-weight breaker now available from LeRoi Division, Westinghouse Air Brake Co., has a shock-absorbing handle—an adaptation of the shock-absorbing handles which LeRoi introduced last year on its line of sinker drills and which proved popular with both operators and contractors.



LeRoi Model LB75 Breaker

Designed to absorb recoil and vibration, the new LB75 breaker delivers the same impact power as the former C11 model. Tests show 65% of the shock and recoil are absorbed by the new handle. Nearly all vibration and shock are eliminated from the operator's upper arms, shoulders and head. Model LB75 is available as a paving breaker, a spike driver or as a form pin driver.

LeRoi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

For more details circle 134 on Enclosed Return Postal Card.

Heavy-Duty Ripper

A new heavy duty ripper, built to match the pulling power of torque converter-equipped case "TerraTrac" Models 800 and 1000 crawler tractors has been announced. Designed to provide maximum strength and penetration in hard-packed soils, the new ripper digs to a dept of 20 in. Removable hardened steel teeth are 1½ in. thick and have replaceable drive-on

Ripper for Case "TerraTrac" Tractors

tips. Three teeth are standard, but extra slots are provided so that five can be used for lighter digging. A single tooth can also be used for sub-soiling, ripping old pavement, etc.

J. I. Case Co., Racine, Wisc.

For more details circle 135 on Enclosed Return Postal Card.

36-HP Concrete Saw

A new 36-hp concrete saw Model C-363, announced by Clipper Manufacturing Co. is designed for high production contraction joint cutting and for heavy duty trenching operations. It features dual balance design, one-piece frame for precision weight distribution and easy maneuverability. Line-up time is stated to be cut in half. Constant, adequate weight over the blade prevents riding out of the cut even on the hardest aggregate and at fastest speeds. The positive screew feed quickly raises and lowers the blade in the cut and provides accurate cutting depth control. It also accurately compensates for abrasive blade wear.

Clipper Manufacturing Co., Suite 232, 2800 Warwick, Kansas City, Mo.

Model C-363 Concrete Saw

For more details circle 136 on Enclosed Return Postal Card.

Power Braking System

A new hydraulically operated braking system that reduces operator fatigue is available for use with Blaw-Knox 34E MultiFoote concrete paver. The system—optional equipment—eliminates nearly all manual maneuvering effort in operation of dual drum models.

Touch-control valve levers replace mechanical foot pedal control in crawler traction brake operation. To obtain this optional braking system feature, Blaw-Knox added two valve sections, with operating handles—one for the brake on each crawler track.

Blaw-Knox Co., Construction Equipment Division, Mattoon, Ill.

For more details circle 137 on Enclosed Return Postal Card.

Concrete Spreader

A new concrete spreader, now in production by the Manufacturing Division of Maxon Construction Co., is designed to work with "Dumpcrete" hauling bodies for paving with the central-mixing, non-agitated hauling method.

"Dumpcrete" Concrete Spreader

The basic operations for the "Dumpcrete" spreader are: (a) load, (b) spread, and (c) mover-screed. Spreader bucket can be loaded from either side. It has a capacity of 4 cu. yd. heaped. It can be made to move tranversely or vertically, to tilt, or to open and close. Bucket opening can be controlled to determine rate of flow. Bucket height is adjustable for placing desired slab thickness.

Manufacturing Division, Maxon Construction Co., Inc., 2600 Far Hills Ave., Dayton 19, Ohio.

For more details circle 138 on Enclosed Return Postal Card.

Trucks for Mixers

Models developed specifically for ready-mix service, now in production by Diamond T Motor Truck Co., have front-mounted power take-off. The take-off is rated at 50-hp at 2100 rpm, ample to handle easily any mixer of a capacity normally employed on a truck of this size. Power to turn the drum is transmitted through a drive shaft extending from the truck engine's crankshaft. Frame and bumper of the truck have been extended 11 in. forward to accommodate the installation.

Diamond T Truck With Mixer

Diamond T Motor Truck Co., 4401 W. 26th St., Chicago, Ill.

For more details circle 139 on Enclosed Return Postal Card.

10-Key Calculator

A 10-key "personal calculator" that adds, subtracts, multiplies and divides, and weighs only 6 lb., has been introduced by Bohn Duplicator Corporation. The BDC "Contex" is manually-operated, but has no "handle" in the ordinary sense. It is said to attain speeds that equal or exceed those of electric machines. Capacity in ten digits entered, eleven total. Sub-totals are shown at every step, and subtraction is direct.

Bohn Duplicator Corporation, 444 Fourth Ave., New York 16, N. Y.

For more details circle 140 on Enclosed Return Postal Card.

Stripe Bead Spreader

A new reflectorized bead spreader, announced by S. B. Beugler, Co., automatically drops the beads evenly and immediately on top of the paint stripe, leaving no bare or uneven spots. The beads are imbedded on top of the paint for full reflection. It is stated the stripe does not blacken with rubber marks because tires get traction on the bead stripes. Complete Mark-A-Zone bead spreader units are available in widths for 3⅜-in. or 4-in. stripes and the 5-in. stripe.

S. B. Beugler Co., 3667 Tracey St., Los Angeles 39, California.

Mark-A-Zone Bead Spreader

For more details circle 141 on Enclosed Return Postal Card.

(Continued on page 133)

LONGER, MORE PROFITABLE ROLLER LIFE—THE RESULT OF CONTINUOUS IMPROVEMENT OF CATERPILLAR PARTS

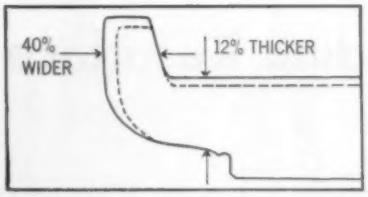
Cat "500" Track Rollers for D8s now have increased rim size for greater strength

A ceaseless search for ways to improve parts performance goes on at Caterpillar. Engineers are constantly striving to make each machine part do its job better, longer and more economically. The payoff for the customer is the steadily improving performance of Cat machines on the job.

New "500" Track Rollers for Cat D8 Tractors, for example, have been redesigned to better resist wear and breakage on the tough jobs. The roller rim has been thickened 12% in its critical area; the flange is 40% wider. The new design prevents rollover and bending of the outer flange under severe side hill loads.

All Cat roller rims are designed so that treads and flanges may be economically rebuilt by automatic welding—a feature which results in big savings over the life of a tractor.

But that's only part of the story. Matchless Caterpillar quality starts with selection of steel. Extensive testing in Caterpillar metallurgical laboratories eliminates all but the finest quality steel *before* roller manufacturing begins. Further tests (61 in all) are made at every stage of production.



ADDITIONAL MATERIAL on new D8 roller rim is shown by dotted line, above. Thicker, stronger flanges give greater wear resistance and a longer productive life.

Cat roller rims are made from forgings to insure maximum strength and uniformity. They are bored and given a controlled heat treatment producing thick, file-hard wear surfaces; the remainder is left tough to resist shock damage.

These rims are shrunk onto cast-iron hubs of high compressive strength and then center welded. This prevents bore distortion and separation. Automatic precision machines finish-bore the roller assemblies. Careful inspection guarantees uniform quality.

Similar Caterpillar quality is built into track roller bearings and shafts, too. A special bronze alloy is used in Cat bearings to support extra-heavy loads. A cast-iron bushing with high compressive strength encloses the bearing.

There is only one way to get maximum production—the production you paid for—from your equipment. Keep your big, yellow machines on the job by using only constantly improved genuine Cat parts. Your Caterpillar Dealer has full information about the new Cat "500" Track Rollers and all the other quality Caterpillar parts. See him today.

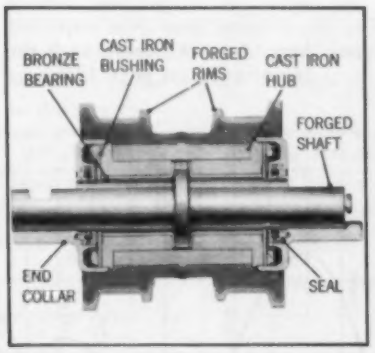
Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

SERVICE TIP

Ask your Caterpillar Dealer about the additional economies provided by 500-hour lubrication periods.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.



ROLLER CROSS SECTION of Cat "500" Track Roller shows rugged construction. Roller shafts are forged for controlled grain structure, maximum toughness and to permit superior heat treatment. Wear surfaces are hardened to a depth of at least 3/32", leaving a tough, strong core.

TOUGH JOBS, like the one pictured above, play havoc with any but the best track rollers. Here's what happened on an actual job: New Cat rollers were installed on the right side of a tractor; another brand of rollers on the left side. After 668 work hours, seals and bearings of two of the other brand rollers failed. They broke up and were lost from the roller shell. The Cat rollers showed normal wear and the 500-hour lubrication proved its value. Owners everywhere are proving that it pays to standardize on Caterpillar—equipment *and* parts.

. . . for more details circle 251 on enclosed return postal card

Leveling Procedure Gives Better Riding Resurface

Special plotting of profile points by inspector enables finisher operator to adjust his screed ahead for improved thickness correction.

By C. C. Tevis

Engineer of Construction, Missouri State Highway Commission, Jefferson City

For a number of years extensive resurfacing has been done on Missouri state roads. Many of these roads had highly irregular surfaces, and various methods were employed in leveling the surfaces with asphalt.

Most of the results left something to be desired as far as riding qualities were concerned. This experience however did help us develop one system which seemed to yield consistently good results. The method was outlined in detail and issued to all districts as a suggested procedure for all future work. This was done two years ago, and while the results have not been perfect, we think the quality of riding surfaces obtained have been greatly improved. The surfaces certainly have been far more uniform than formerly when the resident engineer and contractor were left to solve the problem on each individual project.

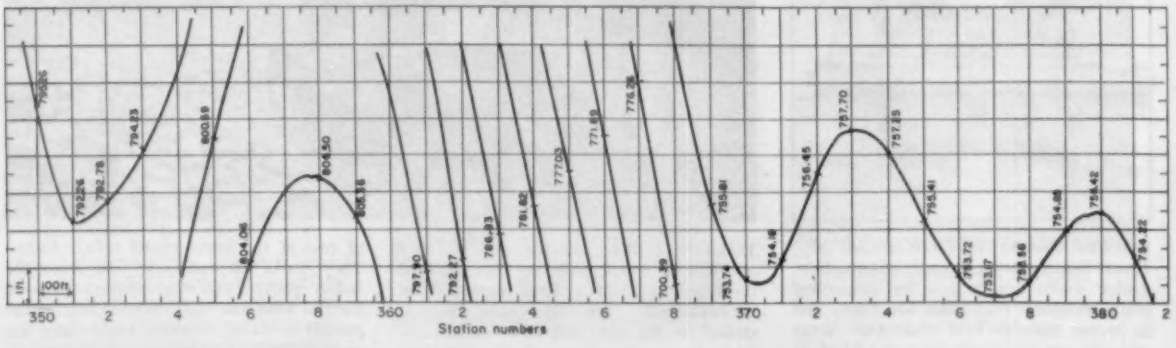
● The method requires that three-point sections be established for the surface to be covered, by taking elevations at each edge and center of the roadway. These are adjusted to the required crown of the finished surface by adding, where necessary, the increase in elevation to the centerline point, the amount that is required to establish the proper difference between center and edge elevations. This results in an adjusted centerline profile which is plotted on an exaggerated scale sufficiently large to permit determination of the grade points accurately to one-hundredth of a foot.

A smooth grade line is laid mechanically over the adjusted centerline profile, and the elevations are determined for the new grade for each 10-ft point along the centerline. By subtracting from these elevations the amount necessary for proper crown, the new grade elevation for each edge point is determined. By comparing these new grade elevations with those originally determined for the old pavement, the thickness of leveling course required at each point can be determined.

The grades determined are for the top of wedge or leveling course. A type "C" asphaltic concrete mixture with a maximum size of aggregate of ¾ in. is used for this purpose. The mix is placed with conventional type finishing machine, using two screed operators to meet the thickness requirements marked on the pavement at each edge and the centerline. Although the 10-ft. interval might appear rather short at first thought, it is considered desirable; for, with experienced screed operators, the screed adjustment is made about this distance in advancement of placement. This short interval of marking also tells the operators the trends in grade, and any changes may be anticipated sufficiently far in advance to meet the required elevation.

Allowances for compaction are generally provided for when the required thicknesses are marked on the pavement. No attempt is made to place wedge over areas requiring less than ⅝-in. thickness; such mi-

(Continued on page 127)



● Chart of profile points aids resurfacing program.

This Barber-Greene Mixall produces even the highest type of hot mix for quality patching and small-job paving. Write for complete information.

Portable, compact Mixall produces any type of mix—on the spot

Here's unmatched versatility in quality patching and small-job paving—the small, highly portable Barber-Greene Mixall. It produces even the highest type of hot mix—*on the spot.*

Of all patch mixers, only the Mixall has a rotary drum dryer and twin-shaft pugmill. These big-plant features permit independent control of drying and mixing, with both cycles operating simultaneously.

Use the Mixall to do this wide variety of jobs:

MIX in all locations, because it's towed and fed by truck loaded with aggregate—or operated at stockpile or pit.

MIX in all quantities, from 3-cu.-ft. batch up to 10 t.p.h.

MIX in all weather to allow quick repair that prevents major damage.

MIX all types of asphalt patch materials, including stabilized base material.

MIX portland cement of lower slump than can be produced by a conventional concrete mixer.

Write for information on the most versatile patch mixer available.

58-21-M

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

. . . for more details circle 242 on enclosed return postal card

PAVE with H. S.*

FOR TOP ADDITIVE PERFORMANCE!

PRACTICAL ADDITIVE EVALUATION

In the Coating-Stripping Tests above, all conditions were identical except for the type additive used. Before coating the aggregate, the untreated asphalt, the fugitive-treated asphalt, and the PAVE-treated asphalt were all heated to 350°F. for 72 hours to represent the total heat conditions normally encountered during shipping, storage, and laying operations.

*HEAT STABILITY in Asphalt

Heat stability of an asphalt additive in asphalt determines the benefit the additive can provide under actual field conditions.

PAVE is completely heat stable in any road asphalt. Even after PAVE-treated asphalt is stored and transported for days at temperatures above those required for road work, PAVE delivers full coating and anti-stripping benefits.

Specify PAVE for these important advantages:

- **Full performance.**
- **Lowest treatment cost.**
- **Requires no special handling.**
- **Blend in asphalt where convenient.**
- **No make-up additive needed.**
- **Pours easily in 100% form.**
- **Prevents stripping in finished roads.**
- **For asphalt cements, emulsions and cutbacks.**

PAVE
HEAT-STABLE

Send for free booklet "Why Use A Heat-Stable Asphalt Additive?" for the importance of heat stability to additive users.

Carlisle Chemical Works, Inc.
Reading, Ohio

. . . for more details circle 262 on enclosed return postal card

Same Pavers Place Base and Hot-Mix

● **The same machine is laying bituminous material on U.S. 441 in Tennessee, after having placed the stone.**

A NEW MACHINE application in laying stone base for asphalt paving is reported by Harrison Construction Company at Alcoa, Tenn. It was the company's idea that a Blaw-Knox PF-90 bituminous paver-finisher could lay base stone as efficiently as it laid bituminous material.

The idea was first tried out on an 8.3-mile section of U.S. 441 between Knoxville and Seiverville. The results proved the company's reasoning. Using the rubber-tired finisher for laying both 13-in. thick calcium chloride stabilized base and a total of 4 in. of bituminous material, the Harrison firm reportedly saved many working days on the project as well as minimizing job equipment cost. Two of the finishing machines placed 5,000 tons of stone a day—mostly ¾-in. maximum crushed limestone and fines with a moist earth consistency—as compared to the 2,000 tons possible using the mixed-in-place method as originally considered. After the base stone was rolled, a 2½-in. binder course and 1½-in. surface course of asphaltic concrete were laid.

The contract was completed in 1957 without a winter carry-over as a result of this high-speed placement. Although the finisher was not designed specifically for laying base material, it handled the job, without alterations between applications.

R. S. Neff, paving superintendent on the job, said that the PF-90, with a 10-ton hopper capacity and 4¼ mph working pace, can put down as much base materials as five graders could mix in a road-mix operation, using only an operator and helper. The Harrison company used 125,000 tons of crushed stone on the project.

LEVELING PROCEDURE

(Continued from page 124)

nor additional thickness is placed with the binder course, as are other variations which become necessary due to not meeting the required grades during wedging operations.

As might be expected, the ideal condition of meeting exactly the desired grades at all points is not always achieved, but this fact is generally realized by the inspectors and appropriate notes are made so the area can be adjusted during placement of binder course. A string line or wire is sometimes used to determine irregularities in these areas, or in some cases additional elevations are taken with a level.

Considerable of the detail involved has been omitted from this description. But the information furnished here will give a general idea of the system being used. This system requires considerable detail work by our engineering forces. We are now developing several programs for the electronic computer which give promise of saving the field forces a large portion of the time and effort previously spent in computations and note preparations. It is generally considered, however, that the improvement in riding qualities of the pavement have justified this method of grade control.

Rubber-Tired Dozer Cuts Hydraulic Filling Cost

● **Soupy sand was a tough job for the dozers at San Francisco's airport.**

SOMETIMES large-tired equipment beats crawlers, and a case example is illustrated here.

Gritty sand was Utah Construction Company's biggest irritant on the $17,000,000 expansion project for the Oakland International Airport in California. The waterfront reclamation project for airport enlargement has required pumping 14 million cu. yd. of sand from San Francisco Bay at the rate of 1,800 cu. yd. per hour.

Crawler tractors were tried, dozing this sand fill 20 hours a day. The sand and salt water were tough on track rails and rollers, resulting in high maintenance and down-time. Then, according to Clark Equipment Co., Utah's costs were cut sharply after a rubber-tired dozer was put on this work. Wear on tires and rims was negligible. The "Michigan" Model 380 tractor dozer used was able to spread the sand at a new high speed, using a 14-ft. blade and pushing distances up to 300 ft.

The four-wheel-drive dozer covered the 600-acre fill area at speeds up to 25 mph, leveling land on long pushes, grading slopes, hauling and shifting pipe sections as work progressed. The new hydraulic fill area lies behind a 4½-mile-long mud and rock dike which encloses 1,400 acres.

Views and Comments

ANTI-STRIPPING ADDITIVES TODAY ... By H. G. Nevitt

SOME YEARS AGO a discussion entitled "The Age of Additives" appeared in this column. The remarks made appear to have been supported by experience, and there has been enough activity in the field of anti-stripping additives to justify further comment.

In our opinion the developments since our discussion have not always represented progress; some developments perhaps have been undesirable. We can view as a benefit the acceptance in practice of additives to prevent trouble from stripping during or after construction; that is, there seems general agreement that some aggregates do cause trouble in actual use and that this trouble can be overcome by the use of a suitable additive in the proper amount. Along with this has come an increased knowledge of the entire technology involved. We think it can be safely said that from the scientific standpoint, everything we need to know about additives is understood or can be explored through suitable techniques.

We think some other developments should be placed on the debit side. Despite the advanced technical knowledge noted above there is much misuse of additives: unsuitable products for the particular project and improper application are only too common. Furthermore, there is a considerable amount of "shotgun" usage of additives without evidence that such additives are needed or without any investigation to determine the proper type, quantity or similar. These practices have resulted in so much waste in certain localities that the future of additives is being jeopardized. In brief, the unwise use of additives, particularly by organizations ill equipped to provide proper controls or indifferent to the technical needs in their use, is tending to discredit the real benefits that such materials offer where needed.

Three factors are involved in the proper use of anti-stripping additives. The first is evaluation of the proposed material for a specific project by some standard test. Strictly, we should say tests, since it appears that a simple preliminary or screening test involving visual evaluation, confirmed by a structural type test for the material to be actually used, is indicated. Along with this standard test is full recognition of the variables which affect the response to the test.

The second factor is the evaluation of exposure conditions. Stripping need not be a matter of concern if there is no exposure that is likely to produce it in a practical amount. The degree and length of such exposure is therefore important.

Evaluating Results

Finally, we have the third phase of evaluating the results of the standard test and the exposure conditions to produce a practical design or construction decision as to whether an additive shall be used, which one and how much. We believe that the reader will agree that these last two factors have not been given as much attention as they deserve.

The problem of a standard test has reached serious proportions. Inspection of the requirements of the states and other agencies discloses a welter of specifications. Some are too mild, some too severe, some inappropriate for the intended use. Yet in our view there is no need for such a situation. A rather simple visual test of the proper severity can be developed without trouble, and there are two apparently suitable structural approaches available for final confirmation of the proposed program. Action by all the agencies concerned with stripping, preferably coordinated, should very quickly produce the simplification needed. Until this is done, the prevention of stripping in actual practice is likely to be an inefficient and perhaps costly process.

The variables that must be given attention in the standard evaluation tests were clearly brought out by Craig at the last Montreal A.A.P.T. meeting. He demonstrates that the aggregate, the asphalt, the additive and the additive amount all affect the results obtained, and only by reflecting the project conditions with all of these can reliable results be expected. The present practice in many states of using a standard aggregate or a standard asphalt or both, in the evaluation of additives is obviously unsatisfactory and likely to lead to false conclusions.

Another phase of the test, or perhaps a variable in it, is the necessity for heat exposure of the proposed additive. It has been frequently demonstrated that many additions offered today will not retain their full efficiency under the conditions of actual use. Generally speaking, the heat exposure in the tests which have been published to bring out this situation is mild compared to the probable history of the additive in actual handling unless definite precautions are taken. Consequently assurance that the additive will stand the temperature that is inevitable in the use of the product, and care that the exposure to this temperature is not too long in the actual handling of the additive, are essential to obtaining the full benefit from it.

As noted previously, the matter of exposure conditions has not been given sufficient attention. The same materials used in a pavement in a wet and poorly drained area may need quite different treatment than when used in a dry climate with negligible subgrade moisture or similar. Similarly, a project in an irrigated area may need protection against ground water even though there may be little danger of rain causing difficulty during the construction period, while a pavement with a badly stripping aggregate in an area subjected to frequent though brief showers may need protection merely to assure continued construction without difficulty. The permeability of the finished pavement and other factors may likewise need consideration. Stripping will

Goodyear Builds Rubber-Asphalt Track

A SPECIALLY DESIGNED rubberized asphalt road, finished to extremely close tolerances, has been built by The Goodyear Tire & Rubber Company near San Angelo, Texas for the testing of tires at speeds higher than possible on the highways. Designed and built for test work exclusively, the unique facility will be used to conduct tire tests safely.

The road, part of a multi-million dollar test proving ground, is a perfect circle, five-mile banked track designed for speeds up to 140 mph or higher.

To aid in the construction, graders and paving machines were built to fit the parabolic curve of roadway. Three different shaped rollers were required to fit the full width. Paving machines and rollers were anchored and counterbalanced.

The paving on Goodyear's new track is hot mix asphalt in two 1½ in. courses, the top layer being rubberized by the addition of Rubarite, a product developed by Goodyear for asphalt paving applications (a finely divded powder, free flowing co-precipitate of sericite mica and synthetic rubber).

The track was designed by Goodyear's Tire Test Division and engineered by Fisher Construction Company of Phoenix, Arizona. All construction work, including paving and design of special equipment for grading, rolling and paving the parabolic curved track, was done by Strain Brothers, Inc., of San Angelo, Texas. Goodyear's engineering department in Akron supervised the project.

● **Specially designed paving equipment and some entirely new paving techniques were required to build The Goodyear Tire & Rubber Company's rubberized asphalt perfect circle.**

ANTI-STRIPPING ADDITIVES

not in practice be a serious factor if moisture does not get a chance to really permeate the pavement, and this is influenced by a number of considerations.

We finally come to the matter of weighing all the data in order to decide on a practical design or construction program. The stripping tendency shown by the preliminary or visual test must be considered; likewise its degree of confirmation from a structural test. The exposure conditions and the probability of these being sufficiently severe to result in actual stripping, where this is indicated as a possibility by the standard tests, must be decided. Finally in the case of construction protection, the probability of expense from taking either route must be estimated.

This all sums up to the statement that stripping is a technical problem with economic aspects, which is the reason that engineering is required; and the prevention of stripping must meet the invariable requirement that it gets the most from the money available. There is too much waste in this field today from lack of attention to engineering fundamentals; this is hurting not merely those supplying the funds for roads but also the engineers and the makers of good additives.

Seen at AAPT's Montreal Convention

NEARLY 300 delegates registered at the Montreal convention of the Association of Asphalt Paving Technologists, held February 17-19. During the 2½-day technical program in which 23 papers were presented and discussed, the members and guests found time to hold the banquet here pictured. Photos courtesy Roads and Streets.

A feature of the Association's program was a symposium on hardening of paving asphalts. With Walter J. Emmons, dean of engineering, University of Michigan, as moderator, this session included papers as follows: "Physical Chemistry of Asphalt Hardening," by Charles Mack, research laboratories, Imperial Oil Ltd., Sarnia, Ontario; "Research Studies and Procedures," by Dr. Dale F. Fink, Wood River Research Laboratories, Shell Oil Co.; "Laboratory and Field Control to Minimize Hardenening," by Paul J. Serafin, Michigan state highway department; "Relationship of Mix Variables to Hardening," by L. C. Krchma, Socony-Vacuum Oil Co., Inc., Kansas City, Mo.; and "Practical Results of Hardening on Pavement Life," by Robert G. Clark, New Mexico highway department.

At the Association's Banquet, speaker's table:

(First Picture): **Ward K. Parr, Michigan state highway department (Association secretary-treasurer); James M. Rice, National Crushed Stone Association (new director at large); Mrs. Ward K. Parr; Warren B. Warden, Miller-Warden Associates; Mrs. Warden.**

(Second Picture): **James E. Ward, Barber-Greene Co. (second vice-president); Mrs. Ward; Walter J. Emmons, University of Michigan; Mrs. H. G. Nevitt; M. R. Brunet, Ed. Brunet & Sons, Ltd., Quebec contractor (the banquet speaker).**

(Third Picture): **Henry G. Nevitt (retiring president); M. F. Macnaughton, Mt. Royal Paving Supplies Ltd., Montreal (first vice-president); Mrs. Macnaughton; William H. Goetz (president-elect); Mrs. Goetz.**

(Fourth Picture): **George H. Dent, Benjamin E. Beavin Co., Baltimore (past-president); Mrs. Dent; Charles Mayer, Asphalt Institute, College Park, Md. (30-year member of Association); Mrs. C. A. Carpenter; C. A. Carpenter, Bureau of Public Roads (past-president).**

Retiring president of AAPT, Henry G. Nevitt, consulting engineer, Kansas City, Mo., congratulates president-elect William H. Goetz, professor of civil engineering, Purdue University, Lafayette, Indiana.

It's the same story everywhere... more and more leading contractors are BUYING MADSEN!

The MADSEN Model 481 Asphalt Plant

ENGINEERING DATA

- PLANT SIZE—6000-lb. BATCH CAPACITY
- MIXER—MADSEN MODEL 460 TWIN-SHAFT PUG MILL MIXER (Power—125 H.P. Electric Motor)
- SCREEN—48" x 16' SYMONS 2-DECK WITH SPLIT DECK (Power—15 H.P. Electric Motor)
- DRYER—MADSEN 96" x 30' COUNTER-FLOW DRYER (Power—75 H.P. Electric Motor)
- DRYER BURNER—12" MAXON (low pressure) (Blower Power—75 H.P. Electric Motor)
- DUST COLLECTOR—MADSEN 12' CYCLONE (Exhauster Power—125 H.P. Electric Motor)
- WET TUBE DUST WASHER—MADSEN TRIPLE TUBE
- TYPE OF FEED—TUNNEL CONVEYOR TO DRYER
- MINERAL FILLER ELEVATOR AND SCREW

Wherever you go, you will see MADSEN Asphalt Plants serving successful contractors.

The increasing popularity of the MADSEN Model 481 Asphalt Plant is due to its versatility and outstanding production performance. The Model 481 may be set up as a permanent installation or if desired, screen-bin unit, mixer weigh-box section and hot stone elevator may be wheel-equipped at the factory or in the field for 100% portability. Fully automatic operation is optional. Some of the additional advantages of this popular plant are:

- CLEAN OPERATION (MEETS AIR POLLUTION REQUIREMENTS EVERYWHERE)
- FAST, PRECISION TIMING AND WEIGHING
- CENTRALLY LOCATED FINGER-TIP CONTROLS FOR BIN GATES, WEIGH-BOX, MIXER AND ASPHALT INJECTION SYSTEM
- OVERSIZE CONSTRUCTION THROUGHOUT INCLUDING LARGER ELEVATOR, SCREEN, BINS, WEIGHBOX, MIXER AND DRIVES
- MADSEN TWIN-SHAFT PUG MILL MIXER WITH EXTERNALLY REMOVABLE LINER SECTIONS
- MADSEN ROLL-AWAY WEIGHBOX FOR EASIER, FASTER MIXER MAINTENANCE

Whether you are an established operator or a new-comer in the asphalt business, you will find the MADSEN Model 481 (4000-lb., 5000-lb. or 6000-lb.) Asphalt Plant ideal for your needs.

North, South, East or West...There's a MADSEN Distributor near you to serve you. And, for your convenience MADSEN maintains a complete parts stock in Los Angeles and Lima, Ohio.

ESTABLISHED 1910
THE OLDEST
MANUFACTURER OF
ASPHALT PLANTS IN THE WEST

MADSEN *Equipment that Serves*

Ask your MADSEN Distributor for Catalog No. 800-A or write MADSEN Works Baldwin-Lima-Hamilton Corporation P.O. Box 38, La Mirada, California

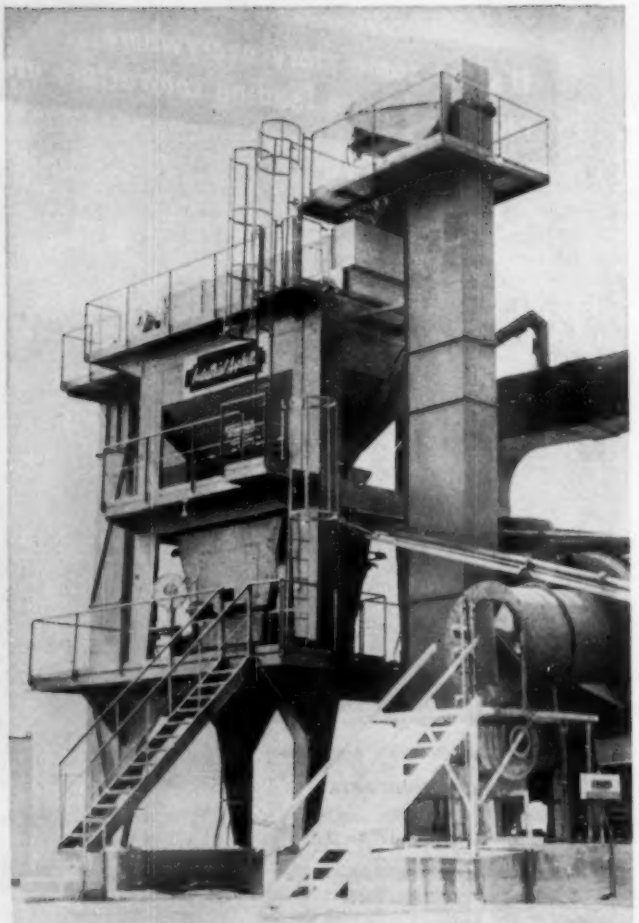
THE MADSEN LINE OF PRODUCTS
FOR THE ASPHALT PAVING INDUSTRY

ASPHALT PAVING PLANTS • PUG MILL MIXERS • AGGREGATE DRYERS • DUST COLLECTOR UNITS
ROAD PUG TRAVEL-MIX PLANTS • WEIGH BATCHERS • SUPER FLOAT AND JOHNSON FLOAT FINISHERS
ASPHALT TANKS • ROYAL CROWN PUMP VALVES • ASPHALT AND FUEL PUMP UNITS

MADSEN WORKS
BALDWIN-LIMA-HAMILTON
CONSTRUCTION EQUIPMENT DIVISION
DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Lima • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

. . . for more details circle 295 on enclosed return postal card

AMERICA'S NUMBER ONE ASPHALT PLANT!



Successful contractors throughout the nation recognize the *STANDARD model R-M* as *AMERICA'S NUMBER ONE ASPHALT PLANT* because of its superior design and quality.

Big — Fast — Rugged — Clean — Economical — describe the STANDARD model R-M Asphalt plant with its king-size capacity — Super-Lift dryer (with saw-tooth lifter) — heavy duty, Hi-Speed mixer — Simplex push-button batching control — positive control of liquid asphalt — over-size elevator and vibrating screen — are some of the *many money making features* assuring higher production with less maintenance for successful contractors — everywhere!

Available in 2000, 3000, 4000, 5000, 6000, 7000 and 8000 pound batch capacities. No matter what your hot mix needs are, there's a STANDARD R-M plant to do the job. Economical, low erection and operating costs provide more profits year in, year out.

STANDARD Model R-M

ASPHALT PLANTS

STANDARD STEEL CORPORATION

General Offices & Plant, 5003 Boyle Avenue, Los Angeles 58, California

Midwest Offices & Plant **LEADER IRON WORKS** *Decatur 3, Illinois*

(Division of Standard Steel Corporation)

ROTARY DRYERS • KILNS • COOLERS • ASPHALT PLANTS

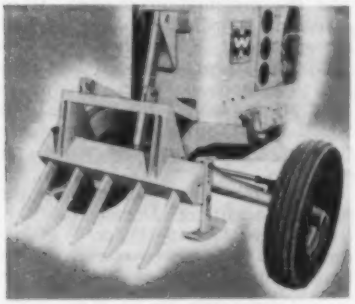
. . . for more details circle 311 on enclosed return postal card

More New Products

Scarifier Attachment

A completely new five-tooth scarifier attachment for the Huber-Warco maintainer has been engineered for maximum efficiency in medium and light duty scarifying of blacktop, stone, gravel, dirt and other materials. It has a swath width of 33 in. and a scarifier pressure of 2,400 lb., and can be quickly attached to the same hydraulic-controlled lifting unit as the bulldozer and snow plow attachments.

Huber-Warco Company, Marion, Ohio.

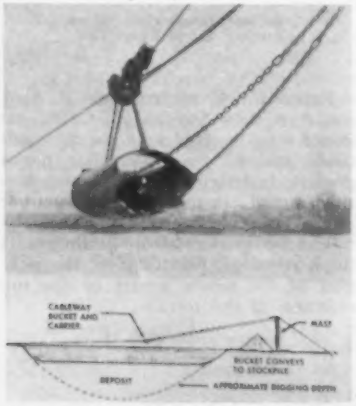


Huber-Warco Scarifier

For more details circle 142 on Enclosed Return Postal Card.

Cableway Bucket

A new "slackliner" bucket applies certain characteristics of the "Sauerman Crescent" drag scraper to a new line of Sauerman slackline cableway buckets. The design permits the bucket to be made lighter in weight for a given strength, and is stated to require less line pull than other buckets of the same rated capacity.



New "Slackliner" Bucket With Drawing Illustrating Slackline Cableway Excavation Method

The "Slackliner" has a continuously curved cutting edge designed to quickly penetrate hard-digging material and move it into the bucket with minimum resistance. This curve also gives more tension in the cutting edge and much less bending stress. The bucket is made in three sizes: 1, 1½ and 2 cu. yr.

Sauerman Bros., Inc., Dept. R-18, 620 S. 28th Ave., Bellwood, Ill.

For more details circle 143 on Enclosed Return Postal Card.

New Mail Service for Material Tests

A new "Mail-Test" service applicable to all highway materials is announced by Haller Laboratories. Under it, representative samples are mailed to the nearest Haller laboratory, where chemical and physical analyses are carried out, and reports mailed back or called in—if a change is warranted—so that remedial action can be taken fast. The service is available to all governmental or private agencies requiring tests. Laboratories are located at New York, Boston, New Haven, and Plainfield, N.J.

The Haller Testing Laboratories, Inc., New York, N.Y.

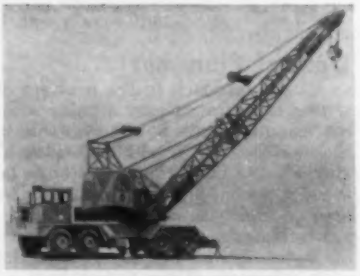
For more details circle 144 on Enclosed Return Postal Card.

35-Ton Truck Crane

The new Koehring 435 truck crane handles safe load lifts up to 35 tons with a 40-ft boom and has a top travel speed of 26.5 mph.

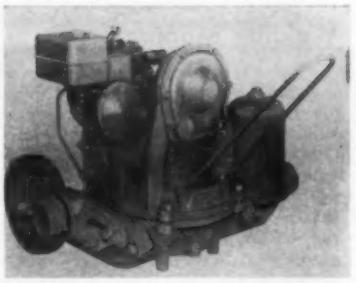
Capable of swinging a 120-ft. boom, the 435 can use boom jibs 15, 20, 25, or 30 ft. long when extra reach is necessary. Safety boom limit stops and automatic power-boom lowerings are standard equipment. Operator can choose live boom if desired. Total weight of truck crane is 89,800 lb. removal of counterweight, pedestals, outriggers and boom lowers the weight to 62,500 lb.

Koehring Division, Milwaukee 16, Wisc.



Koehring 435 Truck Crane

For more details circle 145 on Enclosed Return Postal Card.



Midland 3-in. Diaphragm Pump

3-Inch Diaphragm Pump

A wheel-mounted diaphragm pump with 3-in. hose connections has been added to the pump line of Midland Products Co. It has a capacity of 4,300 gal. per hour. Pump is constructed of aluminum alloy for lightness, with shafts and gears of special material to withstand wear.

Midland Products Co., Midland Park, N.Y.

For more details circle 146 on Enclosed Return Postal Card.

52-HP Steam Generator

A new 52-hp portable steam generator, Model SG-52, introduced by Bros, Incorporated, is an all-purpose machine with exclusive 2-pass down draft design and a modified Scotch Marine type boiler. It has a heating capacity of from one to three 10,000-gal tank cars.

Using the exclusive Bros 2-pass design, the SG-52 is stated to achieve normal operating pressures in just 20 minutes from a cold start. Model SG-52 is designed for 163 psi and operates at 150 psi.

Bros., Incorporated, Road Machinery Division, 1057 Tenth Ave., S.E. Minneapolis 14, Minn.

For more details circle 147 on Enclosed Return Postal Card.

Worthington Model 300 Positioner

Welding Manipulator

A new Worthington automatic welding head manipulator was displayed for the first time at the recent American Welding Society Show.

Manufactured in a full range of sizes from 6 x 6 to 12 x 12, the automatic welding head manipulators are stated to offer increased production and accuracy through precision control and engineering. Maneuverability and compact control units aid in producing more in less time. Roller clusters grip three ways giving alignment throughout operation.

Worthington Corporation, Positioning Equipment Department, Plainfield, N. J.

For more details circle 148 on Enclosed Return Postal Card.

Athey "Traction Booster"

Traction Booster

Especially designed to provide additional tractive effort when working in sand cuts and fills, over soft ground, on wet road surfaces with adverse grades, and whenever extra traction is required, the Athey "Traction Booster" here pictured imposes approximately 31% more weight on the driver wheels, by transferring weight from the tractor steering axle and from the trailing unit axle. It is controlled by the operator through a simple, one-lever valve.

Offered for mounting on all Caterpillar DV-20 (Series E) tractors.

Athey Products Corporation, 5631 West 65th St., Chicago 38, Ill.

For more details circle 149 on Enclosed Return Postal Card.

Tire for Rough Terrain

A rugged new tire, the "Rock Rib LCM," for use in rough terrain by the construction industry has been announced by General Tire & Rubber Co. It is constructed of General's exclusive "Nygen" cord, has an ultra-heavy ribbed tread with a variable slope in the groove design which aids in the ejection of stone and rock fragments. Its thick tread and shoulders consist of a specially compounded, cut-resistant rubber stock. Four "Nygen" shock plies buttress the 12 to 20 ply tire body.

General Tire and Rubber Co., Akron 9, Ohio.

For more details circle 150 on Enclosed Return Postal Card.

Asphalt Distributors

Two large, asphalt distributors, Models 341T and 351T for truck mounting, are now in production by W. E. Grace Mfg. Co. Capacities are 1000 and 1250 grl, with circulating spray bar up to 24 ft. Insulation is glass wool. A Grace 4 in asphalt pump mounted over the spraybar and close to bottom of the tank, delivers up to 350 gpm. Engine is a Ford 4-cylinder, 38-hp, mounted directly behind the truck cab for cleaner engine operation and less rear overhang.

W. E. Grace Mfg. Co., 6007 S. Lamar St., Dallas, Texas.

For more details circle 151 on Enclosed Return Postal Card.

Mobile Two-Way Radio

Simple, low cost conversion kits that will adapt any Motorola mobile two-way radiophone sold since 1949 to full split channel operation are available from Motorola. Long-time anticipation of electronic advances in mobile equipment is now protecting Motorola users by enabling simple, low cost adaptation to split channel operation, and so providing true protection from obsolescence.

Communications and Electronics Division, Motorola, Inc., 4501 West Augusta Boulevard, Chicago 51, Illinois

For more details circle 152 on Enclosed Return Postal Card.

Optical Plummet

A new approach to the problem of setting up a transit over a point without using a plumb bob is available in the new Warren Knight "Tele-Plumb" and "Plano-Shaft." This is stated to be the first optical plummet which can be used to sight to a point directly beneath the instrument or directly above the instrument by sighting through the main telescope of the transit.

Warren-Knight Co., 136 N. 12th St., Philadelphia 7, Penn.

For more details circle 153 on Enclosed Return Postal Card.

Manufacturers' Literature

CRANES AND SHOVELS COMMERCIAL STANDARDS: The Power Crane & Shovel Association, comprised of 14 leading manufacturers, has recently completed, with the cooperation of the U.S. Department of Commerce, a single new commercial standard, CS 90-58, superseding CS 90-49 and CS 90-E-47, the former respective standards for domestic machines and machines for export.

Purpose of the standard is to establish uniform methods of specification and the presentation of data. It includes the so called "commercial" sizes of equipment nominally rated from ¼ to 2½ cu yd as shovels and from 2½ to 60 tons as cranes. It provides illustrations, tables and lists of items which are of importance for specification requirements and dimension definition.

Copies may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. at 20 cents each, or in limited numbers from the Power Crane & Shovel Association, 75 West Street, New York 6, N.Y. for the same price.

For more details circle 154 on Enclosed Return Postal Card.

PROTECTIVE CLOTHING: A new 8-page illustrated catalog on its line of industrial protective clothing has been published by B. F. Goodrich Industrial Products Company, Akron, Ohio. Charts make it easy to select garments according to weight, service, color and material—rubber, "Koroseal," neoprene, "Hycar." A special section is devoted to glove selection.

For more details circle 155 on Enclosed Return Postal Card.

PRECO INCORPORATED, 6300 E. Slauson Ave., Los Angeles 22, Calif., has issued a 6-page folder on its automatic blade control for Caterpillar motor graders. It describes and illustrates how this control can make a good operator an expert. The control automatically holds the grader blade at the exact slope required, regardless of the position of the motor grader or the unevenness of the terrain.

For more details circle 156 on Enclosed Return Postal Card.

"COMPLETE FLUX ISSUE" of the Technical Information Digest, available from Eutectic Welding Alloys Corporation, 40-40 172nd St., Flushing 58, N.Y., explains flux's role in metal-joining. It tells why the success of any metal-joining operation hinges on the ability of the flux to remove surface oxides, provide full wetting action, protect the

molten filler metal, and minimize and control welding heat impact.

For more details circle 157 on Enclosed Return Postal Card.

JOY MANUFACTURING CO., Henry W. Oliver Building, Pittsburgh 22, Pa., has issued Bulletin NR-6C describing method of constructing belt conveyor systems with steel wire rope instead of rigid framing. Called the "Limberope" conveyor, the system suspends flexible "Limberoller" idlers between parallel strands of rope.

For more details circle 158 on Enclosed Return Postal Card.

PRECO INCORPORATED, 6300 East Slauson Ave., Los Angeles 22, Calif., has issued a new folder devoted to its line of back-rippers. Folder illustrates how back-ripper is installed and how it can be used to boost profits on a wide variety of applications. Economies are substantiated by actual job analysis reports.

For more details circle 159 on Enclosed Return Postal Card.

BIN-TYPE RETAINING WALLS: New catalog RW-3558, available from Product Information Service, Armco Drainage and Metal Products, Inc., Middletown, Ohio, describes metal bin-type retaining walls. Gives easy installation rules and extra advantages. Technical data, curve data, and typical applications are included with photos and drawings.

For more details circle 160 on Enclosed Return Postal Card.

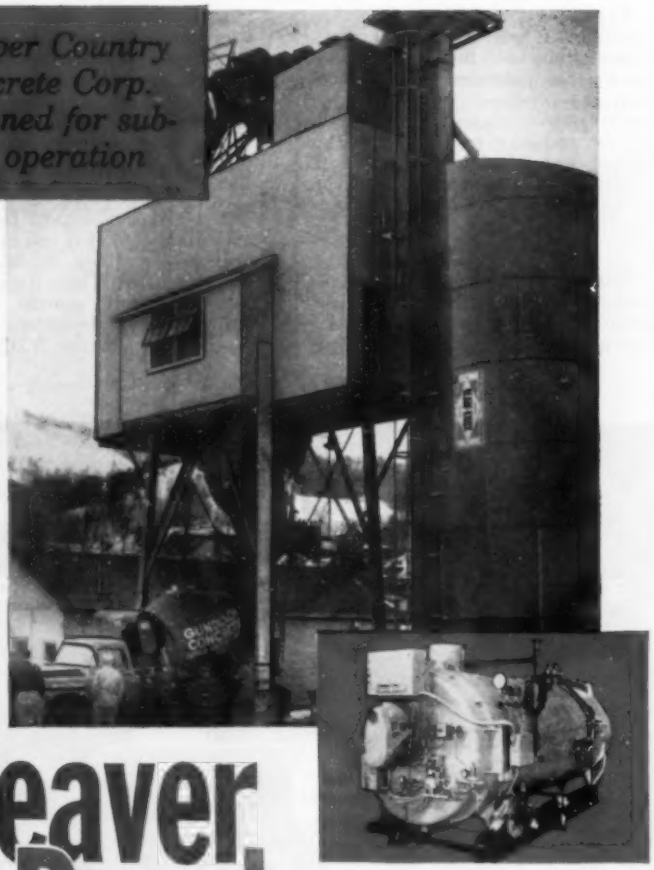
THE BIN-DICATOR CO., 13946-59 Kercheval Ave., Detroit 15, Mich., has issued a consolidated catalog for three of its products for all bulk material level indication and control. Catalog includes photographs, cutaway and schematic drawings, outline dimensions, and general specifications.

For more details circle 161 on Enclosed Return Postal Card.

BARBER-GREENE CO., Aurora, Ill., has announced a 24-page bulletin describing its new 847 continuous-mix asphalt plant which is rated variously from 110 to 300 tph, depending on mix and components operated. Each plant component is described in detail with its theory of operation and field function clearly illustrated with photographs, drawings and text.

For more details circle 162 on Enclosed Return Postal Card.

Copper Country Concrete Corp. planned for sub-zero operation



Cleaver-Brooks packaged boiler — 15-600 hp for steam or hot water applications.

Cleaver Brooks packaged boiler

heats 18,000 gals. water from 33° to 175° F.— Keeps 600 yards aggregate flowing daily in sub-zero weather

Letter from Herman Gundlach, President, Copper Country Concrete Corp.:

"We are most pleased with the new plant and particularly the performance this past winter of our Cleaver-Brooks boiler. We sincerely believe that this boiler is the "Cadillac" of the industry. Our experience to date has proven that.

We built our plant particularly for winter work and in this country, often with 280 inches of snow and temperatures below zero, we had to be well prepared. We therefore installed a 6" reinforced concrete slab on grade of approximately 10,000 square feet in area for the heating of aggregate. The heating of sand and gravel with this jet system was most successful this past winter, often producing for the Al Johnson Construction Company on the Houghton-Hancock Lift Bridge, 400 to 600 yards per day of heated aggregates for this concrete plant, as well as for sand-up-bins, etc.

In addition, the Cleaver-Brooks boiler furnished the steam required to heat our hot water with an internal heating coil system in a 1,400 gallon storage tank. We had no trouble maintaining our water temperature at 150° to 175° even though we were drawing it directly out of Portage Lake at 33°. This amount of water is approximately 18,000 gallons per day. We also used the boiler to clean the carriages of our vehicles.

With all this full-load capacity the Cleaver-Brooks boiler has never been overworked."

For information write Cleaver-Brooks Company, Dept. J, 395 East Keefe Avenue, Milwaukee 12, Wis.

Cleaver Brooks

ORIGINATOR AND LARGEST PRODUCER OF THE PACKAGED BOILER

. . . for more details circle 258 on enclosed return postal card

YALE MATERIAL HANDLING DIVISION, the Yale & Towne Manufacturing Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa. has published an informative 20-page brochure on its Y-18 industrial tractor shovel. Among features detailed are the exclusive, fully automatic Yale torque transmisssion and the safety curve arms. Two pages are devoted to maintenance of the unit.

For more details circle 163 on Enclosed Return Postal Card.

WHEEL TYPE DITCHER: A 16-page folder No. 774, released by Barber-Greene Co., 400 No. Highland Ave., Aurora, Ill., describes the company's new Model 774 wheel type ditcher. Ten unique features are described in detail . Special accessories for operation in rocky ground or in gumbo are also described. Job illustrations are included showing the 774 at work under a wide range of conditions.

For more details circle 164 on Enclosed Return Postal Card.

A. C. ANDERSON, INC., Dept. M 130, Wildwood, N.J. has released a 4-page bulletin describing its Model E hydraulic mowers. These tractor-mounted mowers feature positive, adjustable knife speed, independent of tractor speed, instant change of cutting height to 15 in. or cutting angle from −45 deg. to +90 deg. Other features described are a reversible motor for freezing jam-ups, a heavy duty breakaway with rapid re-engagement, and quick, safe knife changing.

For more details circle 165 on Enclosed Return Postal Card.

STEPHENS-ADAMSON BULLETINS: Conveyor Belt Carrier Bulletin 355, Belt Cleaner Bulletin 258, and Box Car Unloader Bulletin 158, just issued by Stephens-Adamson Mfg. Co., Ridgeway Ave., Aurora, Ill., contain illustrated descriptions, specifications, and comprehensive technical data.

For more details circle 166 on Enclosed Return Postal Card.

A NEW 16-MILLIMETER SOUND FILM in color, showing operations of its Model M8 rotary drills, has just been produced by Davey Compressor Co., Kent, Ohio. Running time, approximately 20 minutes. The film shows Davey drills working in strip mines, quarries, highway construction jobs and in water well drilling.

For more details circle 167 on Enclosed Return Postal Card.

LANCASTER CHEMICAL CORPORATION, Broad Ave. and 13th St., Carlstadt, N.J., has issued new brochures describing its asphalt anti-stripping agents or additives known as "Kling." The uses of "Kling"−XX concentrate in various types of road work are explained and brought up to date. A new brochure is available describing their heat-stable additives.

For more details circle 168 on Enclosed Return Postal Card.

PILE HAMMER DATA: A 6-page Bulletin No. 69, published by McKiernan-Terry Corporation, Dover, N.J., contains physical specifications and performance data on their complete line of single-acting pile hammers. Photographs and sectional drawings of the hammers and sectional drawings of the hammers and sectional drawings of various drive caps are included.

For more details circle 169 on Enclosed Return Postal Card.

CRAWLER TRACTOR REPLACEMENT PARTS: a 26-page brochure, issued by Supertrac Products, 161-10 Jamaica Ave., Jamaica 32, New York details a comprehensive line of undercarriage and engine parts. Material is broken down by model and assembly groups, making it particularly convenient to us.

For more details circle 170 on Enclosed Return Postal Card.

"Our Etnyre 'Black-Toppers' and Hauling Tanks keep us sold"

Two of 22 Etnyre units operated by Central Asphalt Inc., New Hartford, New York. A 1250 FX 400 Style D "Black-Topper" is shown loading 350-degree bituminous material from an Etnyre Hauling Tank equipped with low-pressure burners.

Recently adding two new Etnyre "Black-Topper" Distributors and a new Etnyre Hauling Tank to bring their fleet up to 16 distributors and 6 transports, Central Asphalt Inc. says, "The fine performance and dependability of the units we are operating keep us sold on Etnyre equipment."

Central Asphalt has used Etnyre "Black-Topper" Distributors and Load-Topper Hauling Tanks extensively in the application of all types of bituminous materials throughout their 11 years of successful operation in central, southern, and southwestern New York State.

Etnyre tanks are originally and exclusively designed and made for handling "heavy" materials. Over and over again, the superiority of these tanks in the special service for which they are designed has been proved by substantial users like Central Asphalt. Learn the details *before* you buy another unit! Call your Etnyre dealer or write E. D. Etnyre & Co., Oregon, Illinois, U.S.A.

SEE YOUR ETNYRE DEALER

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS

. . . for more details circle 268 on enclosed return postal card

THOR POWER TOOL CO., Prudential Plaza, Chicago 1, Ill., has issued a 4-page brochure, JR2346, describing the new Thor vibratory concrete finishing screen. Brochure outlines engineering features of this lightweight unit, which has double beam constructure with "strap action" for strike-off and compacting to finish slabs in one operation.

For more details circle 171 on Enclosed Return Postal Card.

"MONOTUBE POLES FOR HIGHWAY LIGHTING AND SIGNING," a 24-page folder, LS-23, released by the Union Metal Manufacturing Co., Canton 5, Ohio, illustrates and catalogs popular highway pole designs, in both steel and aluminum as well as various overhead sign mounting arrangements. Base and bracket details, guide specifications and typical installation photographs are included.

For more details circle 172 on Enclosed Return Postal Card.

"HOW TO STRIP PAINT," an 8-page booklet, F7893, published by Oakite Products Inc., 152 Rector St., New York 6, N.Y., describes in detail four methods commonly used by leading industrial plants for removing paint from equipment. Booklet also discusses treatment of metals before repainting, and prevention of rust on stripped surfaces in storage.

For more details circle 173 on Enclosed Return Postal Card.

ACKER DRILL CO., INC., Box 830, Scranton 2, Pa. has issued Bulletin 1100, describing its new Acker Denison core barrel, for which it has obtained exclusive manufacturing rights. Numerous improvements have been made on the original design, and these changes together with the operation of the barrel are fully explained in the bulletin.

For more details circle 174 on Enclosed Return Postal Card.

VICKERS, INCORPORATED, Detroit 28, Michigan, has issued Bulletin M5108 describing its new line of high-performance balanced vane pumps, which operate up to 2000 rpm and pressures to 2000 psi. This line was developed to meet the trend toward higher engine speeds and increased hydraulic circuit pressures on mobile equipment.

For more details circle 175 on Enclosed Return Postal Card.

BACKHOES AND LOADERS: Ottawa Steel Division, Young Spring & Wire Corp., Ottawa, Kansas has issued a 4-page bulletin describing its new "Big Muscle" Model LX backhoe, which digs 12½ ft. deep in any position of 190° arc. Specifications are included. The new Ottawa Model U loader, designed as a companion tool for the backhoe is described in a separate 4-page folder.

For more details circle 176 on Enclosed Return Postal Card.

ROCK DRILL LUBRICANTS: D-A Lubricant Co., Inc., Indianapolis 23, Ind. has issued an illustrated folder providing complete information on D-A rock drill lubricants.

For more details circle 177 on Enclosed Return Postal Card.

"THERE IS A DIFFERENCE IN DIESELS", a 12-page brochure, released by Detroit Diesel Engin Division, General Motors Corp., Detroit 28, Mich. covers such topics as diesel vs. gasoline engines, the difference in 2-cycle and 4-cycle engines, fuel systems, parts interchangeability, service and others. It includes information on fuel to assist diesel engine owners and operators in selecting the type of fuel that will result in the most satisfactory operation of their engine.

For more details circle 178 on Enclosed Return Postal Card.

GAR WOOD—LOS ANGELES TRUCK EQUIPMENT, INC., is the new distributor in the Los Angeles area for the Gar Wood-St. Paul line of truck equipment, which includes hydraulic hoists, "Load-Packer" refuse collection bodies, and "Pax-All" refuse containers, as well as heavy-duty dump truck bodies, hopper bodies, elevating end-gates, winches, and truck mounted cranes.

For more details circle 179 on Enclosed Return Postal Card.

GALLONAGE COUNTER FOR TRUCKS: A 4-page flyer describing and picturing the application of the "Sentinel" gasoline meter for trucks, to provide an accurate check on fuel used and to present over-charges is available from Sentinel Products Corp., Temple, Texas.

For more details circle 180 on Enclosed Return Postal Card.

CONCRETE FORM AND FITTING CATALOG: The 1958 catalog just released by Williams Form Engineering Corp., 1501 Madison Ave., S.E., Grand Rapids 7, Mich., contains 68 pages of descriptive, and tabular matter, diagrams and pictorial illustrations on concrete forms, fittings, and accessories for all clauses of concrete work from small buildings to massive dam construction. Beside the general index, there is a thumb index for quick reference to fitting types.

For more details circle 181 on Enclosed Return Postal Card.

Materials Tested By Mail

Samples of soil borings, asphalt materials, concrete and other road building ingredients are tested in a "by-mail" service by a New York agency. Haller Testing Laboratories, Inc., handles such testing with special pre-addressed and stamped containers, as a service to private owners, contractors, and public agencies such as small cities, counties, airport commissions.

State-City Cooperative Traffic Signal Clinics

The Colorado department of highways has imitated a series of traffic signal clinics, at which representatives of local government highway and traffic departments together with state workers studied the latest types of signal equipment and servicing.

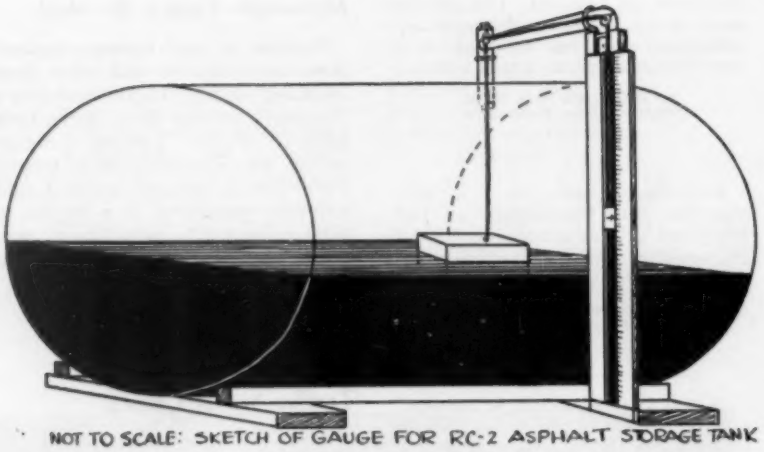
The state department's planning and research engineer Robert E. Livingston, opened the all-day meeting on March 14 at the department's traffic shops in Denver. Joining state engineering, traffic and maintenance employees were municipal traffic engineering personnel from Denver, Boulder, Englewood, Aurora and Colorado Springs.

Traffic engineer Allan R. Pepper explained the purpose of the clinic series with: "As you know, the department of highways has been expanding the practice of issuing bid calls for all types of traffic signal equipment. In addition to providing instruction, ranging from basic concepts of traffic control to the use of complex types of actuated signals, these meetings will also allow us to keep abreast of developments and determine types of equipment which will meet department standards and specifications.

"As we on various levels of government meet together in these critiques, we shall be working together for traffic signal uniformity in Colorado."

● The 187-mile Illinois Tollway will have pavement marking done throughout under a contract for $126,540 awarded to Barker Bros., Inc., Indianapolis, Indiana.

The contract includes deliniation of both outside edges of the pavement in addition to conventional center-line stripping. White reflectorized stripping will utilize 52,000 lb. of reflective glass beads and 26,000 gal. of white paint.



● Sketch of gauge for RC-2 asphalt storage tank. (Not to scale)

Asphalt Storage Tank Gauge

By Zay Johnson
District Maintenance Engineer—District 13

(From Texas Highways)

District 13 of the Texas highway department has recently placed asphalt gauges on RC-2 cutback asphalt storage tanks.

The installation is composed of a hollow steel box, 4' x 10" x 10", which serves as a float inside the tank. To this is attached a small steel flexible cable. The cable is threaded through a 2-in. pipe with pulleys welded inside the elbows, and is attached to a steel aluminum-faced marker.

The gauge is made of a 4" x 12" creosoted timber faced with 4-in. plywood and aluminum strips made from discarded aluminum signs. The tanks were calibrated, and calibrations were stamped in one of the aluminum strips. Black paint was then rubbed into the grooves of the stamped letters and markers. Calibrations are in 50-gal. increments.

These gauges are useful in determining the amount of asphalt in the tank, and in charging out the proper number of gallons withdrawn each time a heator or distributor is loaded.

Design and Construction of Asphalt Pavements

By J. Rogers Martin, Engineer-Manager, Hot Mix Asphaltic Concrete Association of Oklahoma; and Hugh A. Wallace, Managing Engineer, Southwest Division, The Asphalt Institute. 312 pages, 6 x 9, illustrated, $11.50. McGraw-Hill. Address McGraw-Hill Book Company, Inc., 327 West 41st Street, New York 36, New York.

This is a thorough manual of modern methods and technology for the design and construction of the many types of asphalt pavements in use today.

Holding to the viewpoint of the person actually responsible for the design and construction of roads, it deals with such subjects as types of asphalt pavements, petroleum asphalts, mineral aggregates, design of hot-mix asphaltic concrete, construction of hot-mix asphaltic concrete pavements, asphalt pavements and bases employing liquid asphalts, surface treatments and seal coats, reconstruction of old pavements, design of the flexible system, testing procedures, and design methods. The techniques presented in this book represent major practices throughout Continental North America.

The authors' treatment is completely practical, yet it includes the essential theory needed for a broad understanding of the principles involved in good design and construction. The volume also includes testing exercises to give a working knowledge of the fundamentals of control and design testing. It is highly suitable for self-study use.

J. Rogers Martin has had wide experience in the construction of asphaltic pavements and related items. His co-author, Hugh A. Wallace, has been directly or closely associated with highway construction for over 33 years.

Crown Types for Divided Highways

Twenty-four state highway departments and eight turnpike agencies were queried as to type of crown used on multi-lane divided highways and the reasons for their selections.

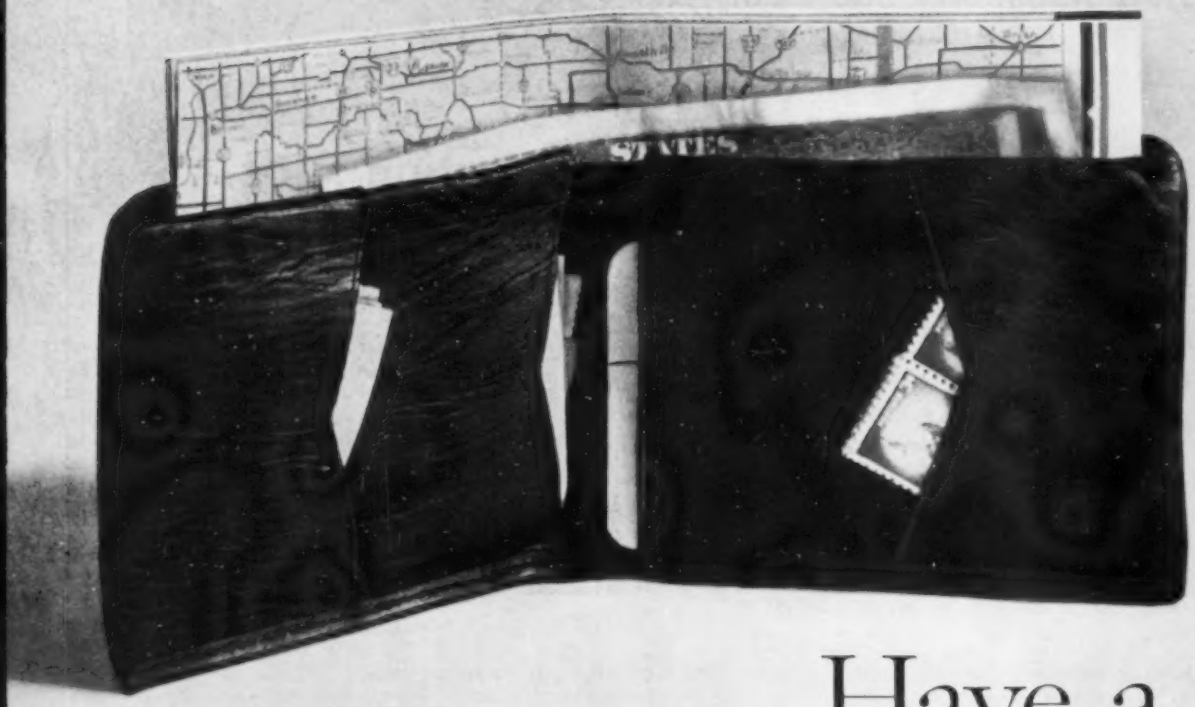
Reports varied but showed heavy preference for a one-way crown slope where dividing strips are narrow (12 ft. or less between pavement edges, on tangent sections) and two-way slopes for wider medians. The author's discussion is directed to the wide-median type highway, since the one-way slope is nearly universal for the narrow type.

Motor vehicles are designed generally for driving on a crown that slopes to the right — that is, on the right hand lane of an ordinary two-lane highway. This puts the manufacturers into disagreement with AASHO recommendations, as noted in the following paragraphs:

"AASHO reports that 'vehicles are built with a symmetrical caster-camber arrangement for pavements that are level transversely. . .' and, as a result, the relatively small pitch of a 1⅛% cross slope is to be considered negligible. However, according to the automobile manufacturers, the front-end alignment is adjusted at the factory to compensate for pavement cross-slope. This adjustment is +⅛° camber to the left front wheel while the right wheel remains vertical. Past practice has been —¼° on the right wheel and +¼° on the left wheel. In addition, it was found that dealers, garages and service stations possessing factory specifications adjusted re-alignment of front ends to this same differential.

● "What this represents to driver comfort and riding quality can be shown by the following analysis. If a car is aligned to ride perfectly on the "right-hand" of a road, as it appears all cars are, it has a built-in crown compensation of 1⅛% (assuming this value as the common standard for most multilane roads). Thus, on a perfectly flat pavement, this built-in compensation would tend to pull a vehicle to the *left*. When a vehicle rides on the "left-hand" side of the road, the negative crown (to the left) must be added to this —1⅛% or to the built-in compensation and the sum result is a total crown effect equal to a 3% slope to the left. The AASHO advises that a crown effect of this amount is undesirable and will affect driver characteristics, because the over-whelming majority of roads in the United States are two-lane roads with a two-way crown, it is unlikely that the automobile manufacturers will change their method of front end alignment."

HELP GET THE MOST OUT OF EACH HIGHWAY CONSTRUCTION DOLLAR



Have a Materials Interchange Plan

Highway construction programs must keep moving. This calls for constant materials availability. And that is where Asphalt may help you.

At least one Midwest state has adopted a Materials Interchange Plan that includes Asphalt. Specifications and designs are for interchangeable materials of construction so that *roads are built with materials available at the time of construction*. Time and manpower is saved by writing specs and designing projects just once.

With Asphalt you can get into action fast and without the extensive engineering and planning other construction materials require. Less engineering manpower is needed to plan and build with Asphalt. New highway construction, as well as the rejuvenation and improvement of existing roads, costs less with Asphalt.

Standard Oil produces Asphalt at four convenient Midwest locations. Tank car and truck deliveries are made from the Standard Oil refinery nearest your job. Technical service on Asphalt for highway construction is provided by Asphalt specialists who work out of Standard Oil offices all over the 15 Midwest and Rocky Mountain states. And Standard delivers on contracts in times of short supply as well as when materials are plentiful.

Get more facts about Asphalt from the Standard Oil office nearest you. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

You expect more from STANDARD and get it!

Profiles Plotted by Radar–

Photogrammetry Short-Cut –

Fast New Highway Locating Aids

Latest labor savers in highway location analysis: airborne radar measurements of terrain profile, and automatic reading of vertical measurements from three-dimension air photograph terrain images.

By H. A. Radzikowski, Chief
and S. E. Ridge, Assistant Chief

Division of Development, Office of Operations, Bureau of Public Roads, Washington, D.C.

RECENT developments have given the engineer further steps by which photogrammetry and electronic computers can be integrated into the terrain analysis process, for the location of highways and the geometric stake out on the construction site. These steps as reported recently at Toronto, are the following:

1. Airborne radar scanning and recording of terrain profile, for use in establishing map scale and in bridging ground control from known ground monuments.
2. Automatic orientation of aerial photographic pairs in a stereoplotter, to form an accurate 3-dimension image of the terrain where a highway may be located.
3. Automatic measurement and recording of the elevation of the original ground along the line where the highway may be located, working from these dimensional photograph images.

The instruments which perform these functions have been developed by the Photographic Survey Corporation, Ltd., of Toronto, Canada. This firm specializes in the airborne science of precise exploration and delineation of the earth's surface. The corporation is affiliated with Hunting Associates, Ltd. Another affiliate, Photronix, Inc., of Columbus, Ohio, under the direction of Everett S. Preston, chief engineer, is developing methods for the integration of the new instrumentation into the highway work flow process.

● *Airborne Radar Scanning and Recording of Terrain Profile.* Estimates indicate that under current practices, up to 60 per cent of time and cost of photogrammetry can be attributed to establishing ground controls which will identify the ground locations and 3-dimensional scales of air photographs.

Under the new system, airborne radar instruments are synchronized to airborne cameras and a radar scanned terrain profile is taken at the same time as the air photographs. The radar records the height of the airplane above the terrain. A second instrument which

Profiling Stepped Up 100 Times

The inventor of the AUSCOR device, Mr. G. L. Hobrough of Photographic Survey Ltd., is of the opinion that through the use of this device, the speed of profiling at certain map scales will be increased up to 100 times as compared with a human operator. A scanning speed of 4 in. per second along a profile has been demonstrated and refinements are being incorporated to increase this by a factor in excess of 5.

SWENSON SPREADERS
FOR ICE CONTROL

SPREADS SALT 200 LBS. PER MILE
OR IN ANY DESIRED AMOUNT
Lays a Narrow Strip or Full Traffic Lane

Handles all granular materials — salt, cinders, sand, calcium chloride, rock chips. Spreads at speeds up to 30 M.P.H. Clutch-controlled flow: steady or intermittent for hills and intersections.

Write for complete information

SWENSON SPREADER & MFG. CO.
LINDENWOOD, ILLINOIS

. . . for more details circle 314 on enclosed return postal card

is a sensitive pressure altimeter or hypsometer is synchronized with the radar and the airborne cameras to, at the same time, record the height of the aircraft above sea level. The latest airborne profile recorder carries the symbol MK-5 and, for the purpose of brevity, is referred to as the APR system.

It will now be possible with only a known ground location outside of or near the terminus of highway projects to identify the ground location and 3-dimension scale of the entire air photograph strip of the highway. The terrain profile obtained through the APR process can be used in what is called "bridging" in photogrammetry to determine ground location and elevation. It will also provide a much easier and more accurate method of employing photogrammetry for preliminary location purposes in inaccessible locations.

● *Automatic Orientation of Photographic Pairs in the Stereoplotter.* Aerial photographs with an overlapping field of view are taken of the possible ground locations of a highway in order to obtain a 3-dimensional image of the terrain in a stereoplotter. This is equivalent to establishing conditions similar to those which produce depth perception in the human eye. It previously required a considerable amount of the time of a highly skilled photogrammetry to adjust each photograph to the proper height in the stereoplotter to correctly represent the relative position of the airplane when the picture was taken.

The newly developed automatic scanning correlator called "AUSCOR" automatically adjusts the photographs in the stereoplotters in a matter of minutes. This is accomplished through a system of electronics and electro-mechanics which senses the relative displacement of the images of the two photographs and then adjusts the position of the photograph in the stereoplotter to bring the images into focus.

● *Automatic Measurement of Elevations on the Terrain Model.* When the terrain space model is established on the stereoplotter from the properly oriented photographs, it has previously been necessary for a highly skilled photogrammetrist to visually and manually adjust the stereoplotter to obtain the vertical measurements of the terrain where a highway may be located. It was also necessary that

Rosco Roller owned by Jay W. Craig Co., Minneapolis, on job at Aitkin, Minn.

Increase Operator Efficiency and Produce More Work Per Hour with the ROSCO ROLLER SR-9-T2

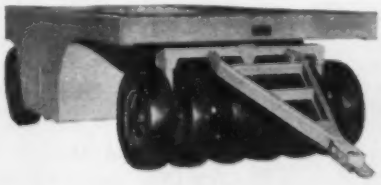
★ Torque Converter ★ Reverse-Omatic Drive

★ Constant Speed ★ Power Brakes and Steering

With this improved 9 wheel self-propelled roller your operator can surface nearly a 6 foot width at working speeds up to 15 MPH. The torque converter and Reverse-Omatic clutch and transmission eliminate scuffing of the surface. Power steering and a throttle setting device that returns to manual at a touch reduce operator fatigue and produce more work per hour.

A modern large-bore, short-stroke engine produces a surplus of power and travel speeds to 30 MPH. Water compartments are integral with the body and other components are set low for safe center of gravity and operator visibility. These features and Rosco's quality construction make the SR-9-T2 a solid investment and profit maker.

Rosco Roller SR-9-T2 with water attachment



Models CR9 and CR13
9 or 13 wheel tow-type rollers, 90 and 120 cubic feet capacity.

ROSCO MINNEAPOLIS

ROSCO MANUFACTURING CO.
3118 SNELLING AVE. • MINNEAPOLIS 6, MINNESOTA

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Grace
ASPHALT
AND COMPACTION
EQUIPMENT

Roadsweepers,

Sheepsfoot rollers

Chip spreaders

Circulating asphalt heaters

Asphalt Distributors

Pneumatic rollers, self-propelled or trailed

W. E. GRACE MFG. CO.
6007 S. Lamar Street
Dallas, Texas

. . . for more details circle 280 on enclosed return postal card

numerical information obtained in this manner be punched on cards or tape before it would be used in an electronic computer. To produce a contour map, it was necessary for the skilled operator to manually move the plotter head through the model keeping it on the lines of equal elevation by visual means.

Under the new development, the sensing head on AUSCOR is coupled to a metering device adjusted to the proper vertical scale of the model. As the sensing head is moved about horizontally by the operator, AUSCOR raises or lowers it with changing elevations and transmits this vertical movement to the metering device.

AUSCOR is considered as a major breakthrough for the eventual automatic production of contour maps where needed. In producing contour maps, the sensing device that now automatically controls the vertical movement to obtain elevations will, when the additional controls are developed, automatically control the horizontal movement of the plotter head along lines of equal elevation.

The machine when placed in operation removes the tedious and routine repetitive work from the photogrammetrist through equally reliable automatic control and read out of vertical heights, especially towards the end of a busy day when a human operator constantly using his eyes may tire.

The next step will be to couple the metering device on AUSCOR to magnetic tapes for automatic recording and storing of the three-dimensions of the scanned terrain. This will reduce the need for contour maps for final highway location purposes by automatically analyzing on an electronic computer the location of a highway on the terrain model stored on the magnetic tape. For these purposes, a prototype of AUSCOR is being turned over to Mr. Preston of Photronix, Inc., to develop the work flow process for highway purposes. Two more prototypes of AUSCOR are to be turned over to the U. S. Corps of Engineers, by the Photographic Survey Corporation, Ltd., for development in their work flow process.

It is estimated that AUSCOR will, even in its present state of development, increase the speed of obtaining terrain information by photogrammetry for highway engineering use by a factor of four. Additional development now contemplated should substantially increase this estimate.

Bending Formula Developed for Laminated Lumber

New formulas for determining the extent to which six species of dry, unheated lumber can be bent, without breaking, have been developed at the lumber and wood products laboratory of Timber Engineering Co., research affiliate of National Lumber Manufacturers Association.

Of importance to all fabricators of glued laminated wood arches and other curved structural timbers, the new Teco development is particularly valuable to those supplying wood laminates for ships and boats, which require bending of many of its glued laminated members to rather sharp radii of curvature.

Developed for the U.S. Navy's Bureau of Ships, the new formulae determine the minimum safe radii of curvature for six woods commonly used in the Navy's wood ship building program.

The "bendability" ratings of the different species, and the new formulae, are contained in the article, "Safe Bending Radii for Curved Laminates," co-authored by William J. Finnorn, chief of the Teco laboratory's Glued Products section, and Andrew Rapavi, wood technologist in the Wood Products branch of the Navy's Bureau of Ships.

The article is featured in Wood Research No. 29, copies of which are available, without charge, from Timber Engineering Co., 1319 18th Street, N.W., Washington 6, D. C.

Road Construction Workers Under N. Y. Safety Regulations

Workers on heavy construction projects in New York—road construction, bridge building, earth-moving operations, large-scale excavations, trenching, pipe-laying—now come under the state's worker-safety regulations governing the construction and demolition industries—A Board of Standards and Appeals action so rules.

Formerly the safety regulations, Industrial Code Rule #23, had been applied only to the erection and demolition of buildings and other above-ground structures. The Board decided to extend code rule to heavy construction workers after a series of state-wide public hearings.

STEP-BY-STEP

Changing Tubeless Tires on Earthmover Rims

Figure 1. Deflate tire. Attach hydraulic removing tool frame assembly to outer rim flange.

From Goodyear Tire & Rubber Company

THE 5° tapered rim being used with earthmoving tires, 16.00 and larger, presents slightly different mounting and dismounting problems from other equipment. Many of these tires, particularly on driving wheels, will have to be mounted and dismounted in a vertical position. The design of these rims and tools is such that the sequence of operations of mounting and dismounting is of prime importance. The recommended procedure is as follows:

1. Completely deflate the tire before attempting any tire removal. This can best be done by removing the valve core.

2. Attach the hydraulic removing tool frame assembly to the outer rim flange by slipping the clamping jaws over the outer edge of the flange. (Fig. 1)

3. Securely tighten adjusting screws at bottom of jaws. Set hand screw against lock ring and adjust until jaw assembly is in a right angle position to the plane of the flange.

4. With spade tip down and ram in retracted position, insert spade and ram assembly between open sides of frame. Place spade tip between tire bead and rim flange. Lift ram until trunnion engages frame shoulder support and move stop screw into support ram. (Fig. 2)

5. Apply pressure to ram and spade by means of pump until spade has moved tire bead toward center of rim assembly far enough to permit the placing of a bead wedge between bead and flange on each side of the tool. Release

Figure 2. Place spade tip between tire bead and rim flange.

Figure 3. Apply pressure to ram and spade to permit placing of bead wedge.

Figure 4. Move 90 degrees and repeat; Repeat until tire is freed.

Figure 5. Insert flat end of pry bar tool into breaking notch on lock ring and pry lock ring up.

Figure 6. Remove "O" ring; remove bead seat band and flange. Break beads loose, and remove tire from the ring.

Figure 7. Place near flange over rim base.

Figure 8. Lower tire over rim base.

Figure 9. Put front flange on rim base.

Figure 10. Place bead seat band over rim base.

Figure 11. Place lock ring in lock ring gutter. Tap into place with babbit hammer.

Figure 12. Lubricate rim base "O" ring and insert in "O" ring groove in base.

pump pressure. Remove spade and ram assembly from frame. Loosen clamping jaw bolts and remove from flange. (Fig. 3)

6. Move to spot approximately 90° from first application (either direction) and repeat entire procedure. Repeat procedure until tire is freed from rim. Four to five applications usually accomplish this. (Fig. 4)

7. Insert the flat end of a pry bar tool into the breaking notch on the lock ring, and by moving the tool towards the center of the rim pry the lock ring up out of the lock ring groove. A slight tapping with a babbit hammer may be necessary for complete removal. (Fig. 5)

8. Remove the "O" ring from the base. Remove the bead seat band from the rim by inserting the hooked end of a pry bar tool and prying upwards. Remove flange.

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Figure 13. Lift tire to seal bead seat band and "O" ring in rim base.

Break the bead loose on the back side of the tire. (Fig. 6)

9. Remove the tire from the rim.

Before assembly of the tire to the rim, lubricate both tire beads and the rubber "O" ring with a thin solution of high grade soap flakes and water or equivalent.

Clean dirt and corrosion from all rim parts, particularly in the grooves where the "O" rings will seat. It is often desirable to paint the tire rim with a good anti-corrosive paint.

Mounting of Tires

Before putting the tire on the rim, insert the valve spud into the rim valve hole and secure tightly with hex nuts on the tire side of the rim. Insert the valve stem in the valve spud and tighten with a wrench. Where valve is not readily accessible for tightening with a wrench, a turret-type valve must be used. Apply turret valve stem through channel on the underside of the rim, insert lock screw and tighten with a torque of 50 to 55 inch-pounds.

1. Place the rear flange over the rim base, being certain that the drive lug in the flange engages in the slot of back section. (Fig. 7)

2. Make certain that valve assembly is secure in place. Place the tire over the rim base and lower into position. (Fig. 8)

3. Place the front flange on the rim base, being sure that the drive lug on the flange is approximately 5-in. in a clockwise position from the drive lug in the rim base. (Fig. 9)

4. Place the bead seat band over the rim base being certain to line up the drive lug in the flange and the drive lug slot in the bead seat band. (Fig. 10)

5. Place the lock ring in the lock ring gutter. Tap into place with a babbit hammer. The drive lug in the lock ring must fit in the slot in gutter. Tap bead seat so that band will drop below "O" ring groove in the rim base. (Fig. 11)

6. Lubricate the rim base "O" ring and insert in "O" ring groove in base. (Fig. 12)

7. Lift the tire upwards to effect a seal between the bead seat band and the "O" ring in the rim base for airing. Inflate tire to 75 psi minimum to seat bands against flange. Then reduce to recommended pressure. (Fig. 13)

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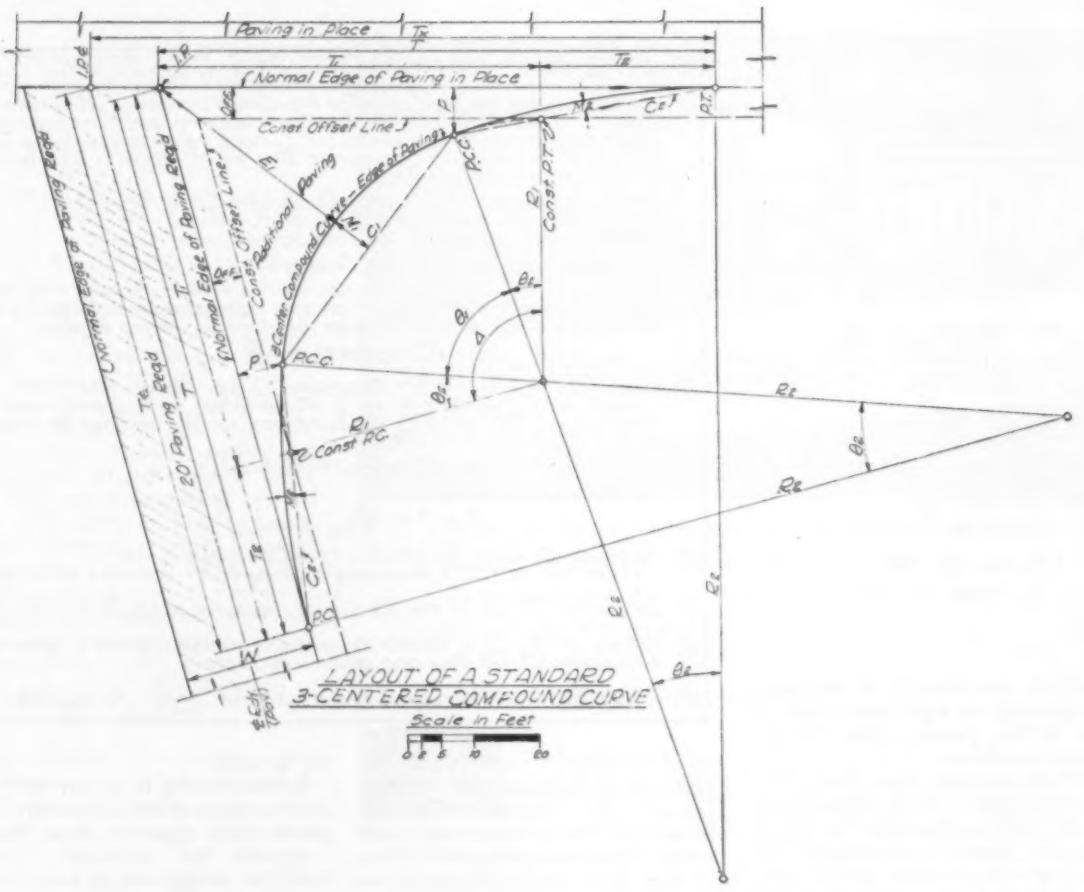

The Three-Centered Compound Curve

—Its Design and Construction

The contractor's staff as often as the highway or street department, is called on these days to "noodle" in curves at interchange ramps and intersections. This time-saving method, developed by a professional land surveyor, is here published for the first time.

By George W. Schults
Licensed Land Surveyor,
Atlanta, Georgia

AT AN INTERSECTION of two paved roadways there must be a curved edge of pavement to properly accommodate vehicles turning right from one roadway to the intersecting roadway. This curve must be of sufficient radius at its sharpest point to allow the vehicle to turn in its minimum turning radius without either encroaching

SYMBOLS

T_1 = Construction Tangent Distance of R_1 Curve

T_e = Distance from P.C. (or P.T.) to Construction P.C. (or P.T.) of R_1 Curve measured along Tangent Line. (Normal Edge of Paving)

T = Tangent of Complete Compound Curve.

T_ℓ = Tangent measured along ℄ of Project from P.C. (or P.T.) to I.P.(℄)

T_x = Tangent along edge of Intersecting Pavement from I.P.(℄) to P.T. (or P.C.)

θ_2 = Central Angle of R_2 Curve

Δ = Angle of Turn

θ_1 = Central Angle of R_1 Curve

Offset = Offset of R_1 Curve from Normal Edge of Paving at Const. P.C. (or P.T.)

C_2 = Long Chord of R_2 Curve.

C_1 = Long Chord of R_1 Curve

W' = Normal Width of Proposed Paving.

M_2 = Middle Ordinate of C_2 Chord.

E_1 = External of R_1 Curve.

M_1 = Middle Ordinate of C_1 Chord.

P = Offset Distance of P.C.C. from Normal Edge of Paving.

I.P.(℄) = Intersecting Point, ℄ of Roadway (Proposed Paving Reqd) with Normal Edge of Paving in place.

I.P. = Intersecting Point, Normal Edge of Proposed Paving (Reqd) with Normal Edge of Paving in place.

FORMULAE

$$T_1 = (R_1 + \text{OFFSET}) \tan \frac{\Delta}{2}$$

$$T_2 = \sqrt{(R_2 - R_1)^2 - (R_2 - R_1 - \text{OFFSET})^2}$$

$$T = T_1 + T_2$$

$$T_2 = T + \frac{W}{2} \cot (180° - \Delta)$$

$$T_x = T + \frac{W}{2 \sin (180° - \Delta)}$$

$$\cos \theta_2 = \frac{R_2 - R_1 - \text{OFFSET}}{R_2 - R_1}$$

$$C_2 = 2 R_2 \sin \frac{\theta_2}{2}$$

$$P = C_2 \sin \frac{\theta_2}{2}$$

$$C_1 = 2 R_1 \sin \left(\frac{\Delta}{2} - \theta_2\right)$$

$$M_2 = R_2 \text{ Vers } \frac{\theta_2}{2}$$

$$E_1 = \sqrt{T_1^2 + (R_1 + \text{OFFSET})^2} - R_1$$

$$M_1 = R_1 \text{ Vers } \left(\frac{\Delta}{2} - \theta_2\right)$$

$$\theta_1 = \Delta - 2\theta_2$$

3-CENTERED COMPOUND CURVE CONSTRUCTION

Field and Office Practice for the Construction of Minimum Edge of Pavement Design for Turns at Intersections using Standard 3 Centered Compound Curves, as recommended by A.A.S.H.O. - "A Policy on Geometric Design of Rural Highways" - 1954 - Chapter VIII

(1) Select appropriate 3 Centered Compound Curve for Angle of Turn of the Intersection from Table of Functions.

(2) Layout normal edges of required paving

(3) Layout offset line for Curve Selected.

(4) Construct R_1 Curve. The position of the Radius Point will be R_1 + offset distance at right angles to normal edge of paving at a distance T_1 from intersection of normal paving edges.

$$T_1 = (R_1 + \text{OFFSET}) \tan \frac{\Delta}{2}$$

(5) Establish P.C. & P.T. of Compound Curve. Determine T of Compound Curve by adding T_2 (From Table) to T_1. Determine Station of P.C. (or P.T.) by subtracting (or adding) T_2 from (or to) Station of I. P.(E)

$$T_2 = T + \frac{W}{2} \cot (180° - \Delta)$$

Determine T_x Distance

$$T_x = T + \frac{W}{2 \sin (180° - \Delta)}$$

(6) Measure C_2 from P.C. (or P.T.) to P.C.C. on R_1 Curve. P (OFFSET to P.C.C.) provides a check on position of P.C.C.

(7) Deflection Angle of the R_2 Curve measured at the P.C.(or P.T.) = $\frac{\theta_2}{2}$

(8) Values of T_2, C_2, P, θ_2 and M_2 are constant for each 3 centered Compound Curve and are shown in Table.

(9) Values for E_1 & M_1 Computed as shown under Formulae

upon the centerline of the highway, or allowing the right rear wheel to run off the paving upon the unpaved shoulder.

When the front right wheel of a vehicle is steered to the right at such an intersection, the right rear wheel does not immediately respond or track the front right wheel, and, when it does respond, it does not enter the turning radius of the front wheel, but passes through a transition from a tangential motion to a curved motion which eventually has a turning radius offset to the right of the front wheel turning radius. Thereafter, while the front right wheel is held within the selected turning radius, the rear right wheel remains within its offset turning radius. As the vehicle comes out of the turn, the right rear wheel passes through a transition and finally tracks the front wheel, as the vehicle proceeds on a tangent.

● These characteristics of front and rear wheel travel, which affect the minimum edge of pavement design for turns at intersections, have been recognized by the American Association of State Highway Officials. From field data, it has been determined that a three-centered compound curve best provides the minimum curves required. At the same time, this scheme gives maximum economy in the amount of intersection paving required.

The purpose of this article is to provide aids to the highway designer to enable him to most effectively portray the ideal three-centered compound curve upon the plans, in accordance with AASHO policies. The highway field engineer is also furnished with detailed data so that he may lay out the lines of this curve with exactness upon the ground.

Geometrically, it is very easy to draw a standard three-centered compound curve upon the plans. First, determine the preferable curve from the viewpoints of kinds and

TABLE OF FUNCTIONS FOR STANDARD 3-CENTERED COMPOUND CURVES

Approx Angle of Turn (Δ)	Recommended 3-Centered Compound Curve*								
	R_2	R_1	R_2	Offset	T_2	C_2	P	θ_2	M_2
45°	200	100	200	3.0	24.3	49.0	8.0	12°-04'	1.5
60°	200	75	200	8.5	29.4	47.9	5.6	13°-35'	1.4
75°	100	25	100	2.0	17.2	29.1	2.7	15°-15'	0.7
	120	45	120	2.0	17.2	27.7	2.2	13°-16'	0.8
	120	45	120	4.0	24.2	39.2	6.4	18°-48'	1.6
	150	50	150	5.5	32.7	49.7	6.2	19°-05'	2.1
	150	75	150	3.8	22.6	45.8	7.0	17°-34'	1.8
	150	75	150	5.0	26.9	50.8	10.0	21°-02'	2.5
	180	90	180	3.5	24.9	53.2	7.0	16°-02'	1.8
90°	100	20	100	2.5	19.8	25.0	3.1	12°-22'	0.8
	120	40	120	2.0	17.9	26.6	3.0	12°-50'	0.8
	120	40	120	5.0	27.9	42.4	7.5	20°-22'	1.9
	150	50	150	3.0	24.8	36.7	4.5	14°-04'	1.1
	150	50	150	5.0	31.2	47.4	7.5	18°-12'	1.9
	180	65	180	4.0	31.0	50.4	7.1	16°-05'	1.8
105°	100	20	100	2.5	18.8	25.0	3.1	12°-22'	0.8
	100	35	100	3.0	19.5	30.4	4.6	17°-23'	1.2
	100	35	100	5.0	25.0	38.2	7.7	22°-37'	1.9
	120	40	120	2.0	17.8	26.8	3.0	12°-50'	0.8
	120	40	120	4.5	26.5	40.2	6.7	19°-18.5'	1.7
	150	40	150	6.5	37.9	51.6	8.9	19°-46'	2.2
	150	40	150	7.5	39.9	55.4	10.2	21°-17'	2.6
120°	100	20	100	2.0	17.8	22.4	2.5	12°-50'	0.6
	100	30	100	2.5	19.5	26.7	5.6	15°-21.5'	0.9
	100	30	100	5.0	25.0	37.0	7.1	21°-47'	1.8
	100	30	100	5.3	27.2	39.6	7.8	22°-52'	2.0
	120	35	120	7.0	33.8	48.7	9.3	23°-25'	2.5
135°	100	20	100	1.5	15.4	19.4	1.9	11°-07'	0.5
	120	30	120	6.0	31.2	50.6	10.7	24°-20'	2.7
150°	75	18	75	2.0	15.0	19.9	2.6	15°-18'	0.7
	100	30	100	2.5	18.5	26.7	5.6	15°-21.5'	0.9
	120	90	120	7.5	36.1	49.0	10.0	25°-33'	2.5
180°	50	15	50	5.0	18.0	26.7	7.1	31°-00'	1.8
	100	20	100	10.0	33.8	50.0	12.5	29°-57'	3.2
	100	30	100	5.0	25.0	37.0	7.1	21°-47'	1.8
	120	25	120	11.0	44.4	57.8	13.9	27°-51'	3.5

*NOTE- All Distances are in Feet. — All Angles are in Degrees

amounts of traffic, and the angle of turn of the traffic lane under consideration.[1] It will be noted (see Layout and Table of Functions) that various standard three-centered compound curves are recommended for different angles of turn.

As an example, take the three-centered compound curve recommended for a 45-degree angle of turn (first line in Table of Functions). This is 200-100-200-ft., 3.0′ offset curve, or, a compound curve which has its PC on the normal pavement edge. The initial radius of 200 ft. (see Layout) proceeds on its 200-ft. radius until it compounds with a curve of 100 ft. radius, the construction PC of which is offset 3.0′ from the normal edge of paving. This curve in turn proceeds until it compounds with another 200-ft. radius curve having its PT on the edge of normal paving of the intersected roadway. The construction PT of the 100-ft. radius curve, as with its PC, is offset 3.0 ft. from the normal edge of paving of the intersected roadway.

● To picture geometrically this particular curve, first draw dash offset lines parallel to the normal edge of paving, as shown on layout, at a distance of 3.0 ft. These lines are dashed, and may later be erased. Swing in a 100-ft. radius to these lines. The 100-ft. radius point (center of a circle of 100 ft. radius) will be at the point where lines drawn parallel to the normal paving of each intersecting road, and 103.0 ft. therefrom, intersect. Draw in lines 200 ft. from the edges of pavement. Find the two points where lines drawn from the 100-ft. radius curve will pass through the radius point of the 100-ft. radius curve, and measure 200 ft. in length when they intersect the lines drawn 200 ft. from the edges of normal pavement.

These are the radius points of the 200 ft. circles. From these points, draw in radii curves PC to PCC and PCC to PT, and the curve is complete.

This geometric method of layout, however, is rarely feasible in the field where topographic and mensural difficulties hamper or prevent the swinging of long radii. It is therefore best to locate the PC and PT of the compound curve by determination of the tangent distances from the table and formulae

(1) Chapter vii, "A Policy on Geometric Design of Rural Highways," 1954, AASHO.

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EXAMPLE

Given – Proposed Intersection of 20' Paving with another Paved Road, 105° Angle of Turn to Rt. at Sta. 100+00. Sta. of I.P. (℄)

Desired – Construction of Intersection Curve Minimum Edge of Pavement Design, (Right Edge of Pavement) in accordance with "A Policy on Geometric Design of Rural Highways", A.A.S.H.O., 1954.

Curve to be used – The 120-40-120, 4.5' offset, 3 Centered Compound Curve.

Const. – Lay off Construction Lines 4.5' from normal edges of Paving. Swing in a 40' Radius; Tangent to these lines. Place temporary Construction P.C. & P.T.

Tangent Distance, T_1 = $(R_1 + \text{OFFSET}) \tan \frac{\Delta}{2}$ = 44.5' tan 52.5° = 58.0'. Add T_1 to T_2 (From Table) = 58.0' + 26.5' = 84.5'
Thus – T = 84.5'

Locate P.C. & P.T.

To obtain Station of P.C. subtract T_2 from Sta. 100+00, Sta. of I.P. (℄)

$T_2 = 84.5' + \frac{IV}{2}$ Cot. $(180° - \Delta)$ = 87.2'
Sta. 100+00 – 87.2' = Sta. 99+12.8 = P.C. (of Compound Curve)

T_x (I.P. ℄ to P.T.) = 84.5' + $\frac{IV}{2 \sin.(180° - \Delta)}$ = 94.9'

Measure C_2 distance P.C. to P.C.C. & P.T. to P.C.C. = 40.2'. This establishes P.C.C.'s. P = 6.7' (Check on position of P.C.C.)

Measure C_1 for further check.

$C_1 = 2 R_1 \sin.(\frac{\Delta}{2} - \theta_2)$ = 43.8'

Also –

M_2 = 4.7' (From Table)

$E_1 = \sqrt{T_1^2 + (R_1 + \text{OFFSET})^2} - R_1$ = 33.1'

$M_1 = R_1 \text{ Vers.}(\frac{\Delta}{2} - \theta_2)$ = 6.5'

shown above. Then locate the PCC's from the C-2 and P distances, which are fixed for the standard curves shown in the Table of Functions (or which may be figured from the formulae for non-standard curves). Next locate the center of the R_2 curve from the middle external M_2, swing in the R_1 curve with the chain or tape if obstructions do not prevent; or, if they do prevent, compute the M_1 distance, or the E_1 distance, to determine the location of the midpoint of the curve, thus locating the PC, the PCC's, and the PT, and the midpoints between each of these on the ground.

As an alternate method, where use of the transit is desirable, the transit may be set up on the PCC, which is in most cases most easily located by measurement of the C_2 and P distances (but which can be located by setting up on the PC and turning ½ C_2 and measuring distance C_2), back-sighting on the PC, flopping the instrument and turning ½ Theta_2 to become tangent to the curve at the PCC, and turn-

(Continued on page 153)

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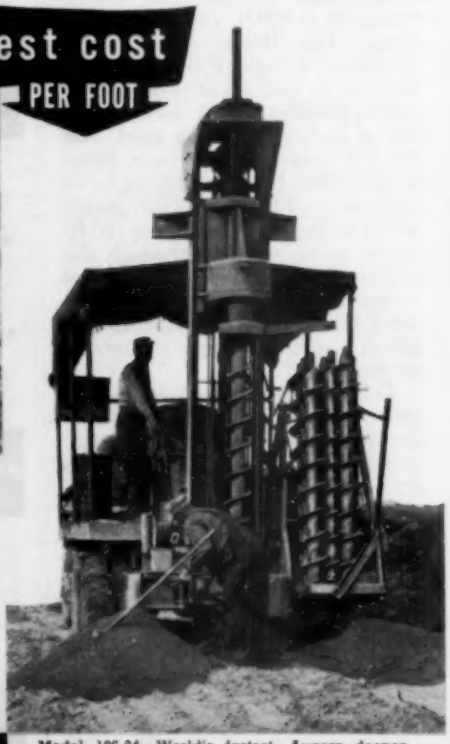

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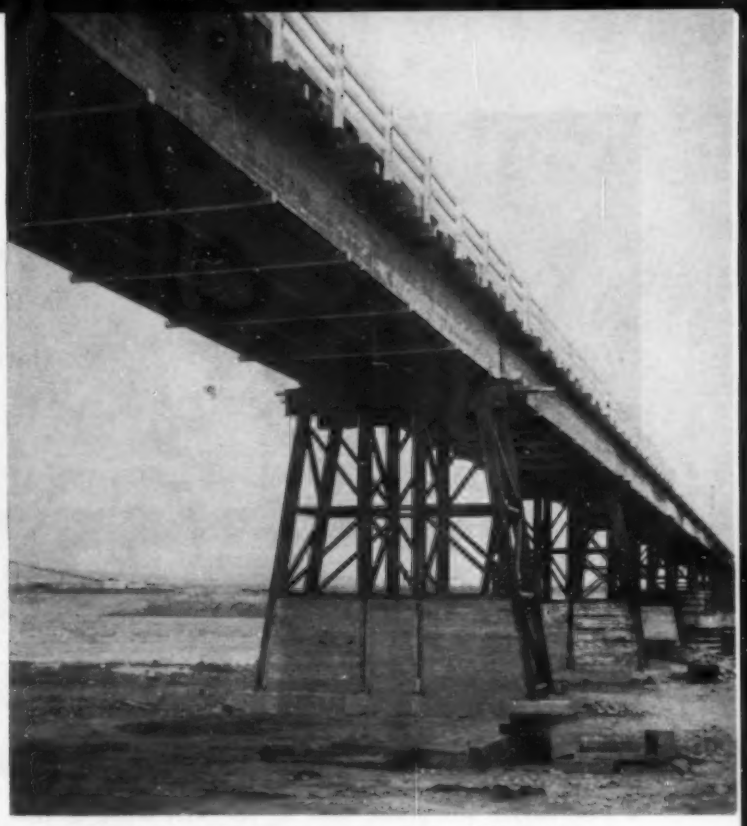


● Cross bracing was designed for unusual conditions of traffic, wind and current flow at flood.

One of the West's longest girder type bridges, and an example of timber's versatility, has been completed across the Columbia River at Priest Rapids dam site.

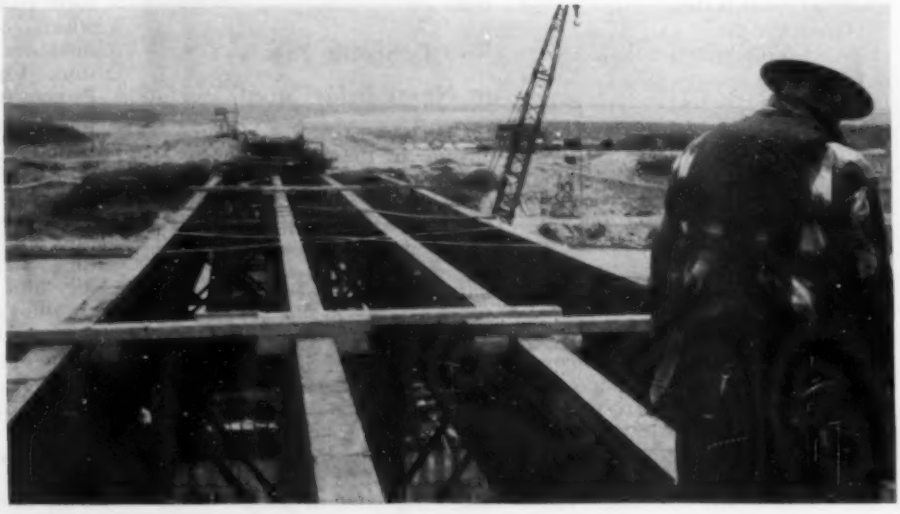
This 1,500-ft. long wooden structure may well be the longest bridge of its kind. Although designed to last many decades, it will remain in service only from four to five years while the dam is under construction. It will not be used by the general public.

This structure spotlights the versatility of the glulam timbers, manmade from Douglas fir lumber. These elements are designed and fabricated by Timber Structures, Inc., at their Portland, Oregon, plant.

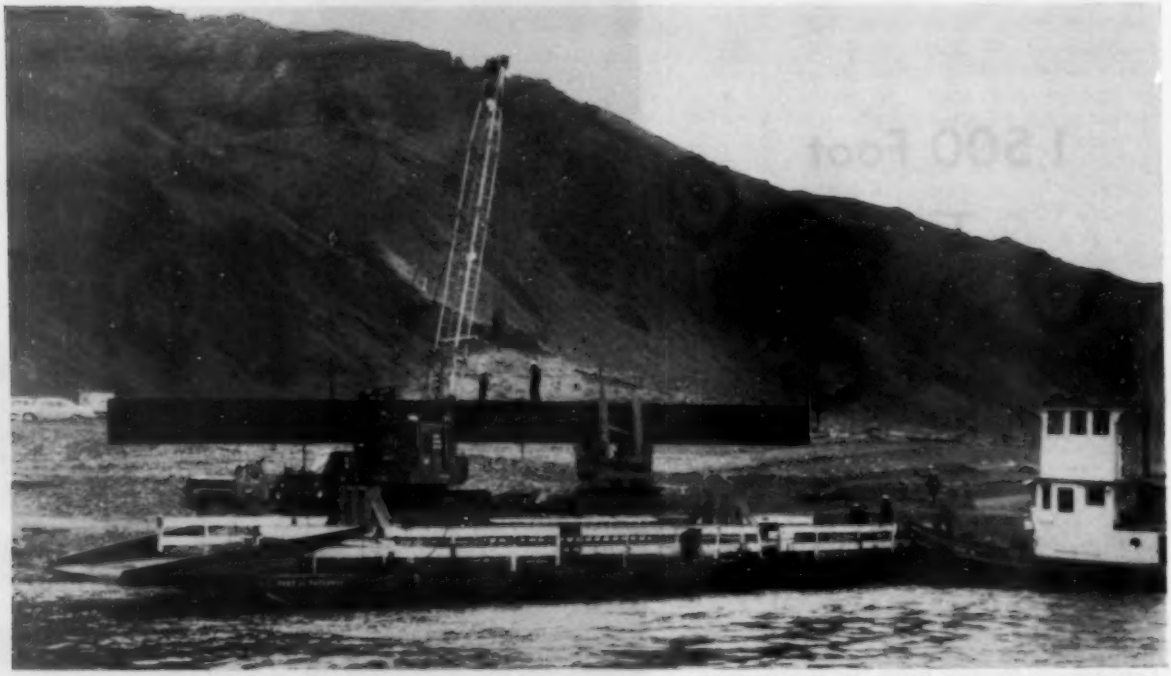
The girders are 100 ft. long with 12¾" by 63⅜" section. Each glulam beam is made up of 39 laminations of 1⅝ in. fir dimension. Four girders are used for each of the 15 spans. After lamination and fabrication, the girders were given a pressure treatment of 50-50 creosote to 8 lb. per cu. ft.

The bridge is of the conventional girder design, planned for loadings sufficient to support a 100,000-lb. Euclid truck in each of two roadways in each span, and an alternate loading imposed by a diesel locomotive and car at the centerline of the bridge. The clear roadway between guard rails is 24 ft.

This particular design is the re-



● 100-ft. laminated girders in place. Construction was simple, requiring no special erection crews.



● Paul Bunyan size beams, came by rail, were loaded on river barge for final placing.

sult of collaboration between Joe Peraino, chief engineer of the Merritt-Chapman & Scott Corporation of New York, and the engineering staff of Timber Structures, Inc. The Merritt-Chapman & Scott firm has the general contract for the construction of the Priest Rapids dam which is being built for P.U.D. No. 2, 60 miles east of Yakima, Washington.

The bridge is needed to give free movement of materials across the swiftly flowing river at this point. It will be dismantled and removed when the dam is done.

Merritt-Chapman & Scott decided on using glulam beams when it was found, upon study, that such beams were cheaper than steel, quickly obtained, and could be easily and speedily placed and dismantled with high salvage value. Ordinary construction crews were able to do the entire erection job, which did not call for specialist

Four girders were used for each span; the center members on 6-ft. and outer members on 7-ft. spacing. Doweled to the supporting girders were 10″ x 10″ fir ties, covered with 6-in. fir planking running longitudinally across the bridge. This deck is capable of supporting two 50-ton loaded trucks passing each other, the two center girders carry the rails. The beams are built up of structural grades of Douglas fir lumber, and resistance to stress.

Beams were shipped by rail to the site, loaded onto barges and moved to exact position where they were needed in the bridge assembly. Construction progressed simultaneously from both banks. The structure is cross-braced to withstand braking of trucks, high winds and high water currents. In overall design the structure actually is one that could, if desired remain in service, if needed, for generations.

Two Concrete Pavers In Novel Relay Stunt

One paver travelled along the outside of the road forms in the customary manner. Another paver came to the rescue, when the first one proved inaccessible to batch trucks, due to soft ground during wet weather.

The second paver's trick was to work along a parallel existing road shoulder, on the other side of the roadside ditch. From this position, it produced concrete, trundled it out on the boom, dropped the bucket-load into the skip of the first paver and the concrete was run through the first paver's drum, and finally deposited in place.

The stunt, which is not offered as an economical one necessarily, was worked successfully by Weymouth Construction Company, Memphis, Tennessee, using a pair of 34-E dual-drum machines.

Heavier Form Lining Job Advantages Cited

Forming problems were eliminated over cost reduction effected on a California project through the use of $\frac{3}{16}$-in. Masonite concrete form presdwood. The project, on which conventional wood four members had failed, is the San Antonio Chino Creek Improvement Project in Southern California.

The original 4x4 wood members with 2 x 2 tung-and-grooved deck failed after the twelfth pouring. The new heavier Presdwood panels were reused fifty times without failure. The new lining required only three men for cleaning and nailing, and the job was completed ahead of schedule, as well as below original cost estimates.

The job, which involved seven miles of vertical creek channel wall areas, sixteen bridges, a conversion dam, and sluices, was done by Alwood Corporation, contractors, of Altadena, California, for the U. S. Army Corps of Engineers.

COMPOUND CURVE

(Continued from page 150)

ing deflections to desired points on the R_1 curve as on any simple curve, the total deflection of the R_1 curve from PCC to PCC being $\frac{1}{2}$ $Theta_1$, and the deflection to the mid-point of the R_1 curve being $\frac{1}{4}$ $Theta_1$.

It will be noted that for each standard curve the T_2, C_2, P, $Theta_2$, and M_2 are constant (see Table of Functions). Other dimensions and angles vary with the angle of intersection.

A properly constructed three centered compound curve is pleasing to the eye, effective for the flow of turning traffic, and economical.

● To insure the proper construction of the three centered compound curve, it is essential that the highway designer provide the distances and angles essential to the field engineer in the accurate positioning of the key points of this curve, recognizing that topographic obstacles and long radii create difficulties in the field which do not exist in the office.

The field engineer may likewise assist in a very real way to create something which pleases the eye, eases the travel, and saves the pocketbook of the taxpayer by informing himself thoroughly concerning the important distances and angles of his three centered compound curves before he puts his men to work on the curves, as no one realizes better than he how difficult it is to figure out a beautiful curve design while men are leaning on their rods and axes, idling their bulldozer's engines, and wondering why a man who doodles in a brown notebook at a time like this was ever sent to college.

Diesel Engine Operation In Very Cold Weather

Diesel equipment owners interested in data on the problems and best procedures in operating their equipment in very cold weather, may want a recent document.

Compiled for the Navy by the Office of Technical Services, Department of Commerce, the bulletin is "Cold Weather Operation Of Diesel Engines: A Bibliography —Part 2", by Ayton, Shea, and Brown. Available by ordering item PB 131492 from OTS, Dept. of Commerce, Washington 25, D.C., Price, $3.75.

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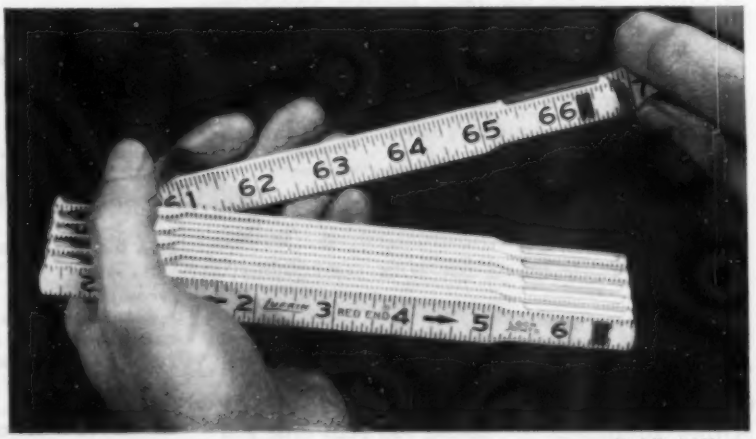

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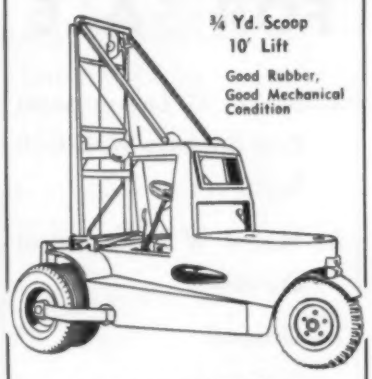

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LeROI 500 Compressor, with Cat diesel.

INGERSOLL-RAND 500 compressor, with Waukesha diesel.

1—**LORAIN** Model 41 Dragline G.M. Diesel 30" Shoes.

1—**KOEHRING** Model 304 Diesel 40 ft. Crane Boom 30" Shoes Fairleads

FLACK-TOLEDO
235 Broadway Toledo, Ohio
Phone: CHerry 3-4561 or 2-4561

Motor Scrapers

4 Allis-Chalmers TS-300 Motor Scrapers, Serial Nos. S-300-544, S-300-546, S-300-615 and S-300-614.

Inspect these machines now working in San Diego County. Immediately available.

$7,500 Each

Take all 4 for $20,000.00

HAWTHORNE MACHINERY CO.
CATERPILLAR DEALER
P. O. Box 708 - San Diego 12, California
Telephone: BRowning 7-2260

REAL BARGAINS
IN
USED EQUIPMENT

Loader - 1953 ¾ yard TD6 International $2,850.00
Backhoe-Loader - 1958 International 4,950.00
Backhoe - 1952 Ford Tractor .. 1,450.00
Loader - 1952 Ford Tractor ... 1,295.00
Trailer - 1958 Tag-along, 4 ton 795.00
Loader 1 1958 1 yd. Terratrac "800" 7,500.00

Lots of good used equipment in stock. We are located just 8 miles South of Camden.

GENERAL ENGINES CO., INC.
Route 130 - Phone TI lden 5-5400
Thorofare, New Jersey

DW-21

Caterpillar DW-21 Tractor with Athey PR-21 Rock Wagon. Like new with 1300 hours. Bargain.

FRANK FAMALETTE EQUIPMENT CO.
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25,000 LB.
HEIL WINCHES
Double Drum - Brand New
GOV'T COST $1400
OUR PRICE - $450.00
F.O.B. Indianapolis.

12,000 LB.
BRADEN WINCHES
BRAND NEW - $165.00

S. Cohn & Son Auto Co.
142 W. Vermont Street
INDIANAPOLIS 4, INDIANA
MElrose 5-5544-45

FOR SALE

3—Model C LeTourneau E-18 Rockers With E-18 Scrapers

2—Model W LeTourneau Scrapers

1—Gradall

Brown & Lambrecht Earthmovers, Inc.

433 S. Chicago St., Phone 7-9211

JOLIET, ILLINOIS

FOR SALE

5—Bucyrus-Erie Tractor drawn scraper, Model B-250 22-27½ c.y., rubber excellent. Each $9,200

1—LeTourneau tractor drawn scraper, Model LP $3,800

1—T-9 International tractor with Bucyrus-Erie angle dozer S/N 8925-T4 ..... $2,500

1—D7 Tractor with rear double drum PCU and 7A angle dozer S/N 3T5240 ..... $7,800

1—Parsons Model 221-2A trench machine, maximum depth 11 ft., 16" to 32" width, S/N 2093 ..... $4,500

1—Koehring longitudinal finish machine 12-28 ft. S/N LF 1433 .. $5,400

1—Koehring longitudinal finish machine 10-12 ft. S/N LF 1037 .. $1,400

1—Koehring longitudinal finish machine 8-12 ft. S/N LF 1127 ... $3,000

1—Model 358 Barber-Greene portable car unloader, electric $1,750

1—Model CHP International Vibro-Tamp S/N 119 ..... $2,800

3360 l.f. 9x9 Heltzel road forms, Per l.f. ..... 85 cents

1—390 bbl. Johnson cement bin, less elevator $1,450

1—70-ton Blaw-Knox aggregate bin, 3-compartment $1,150

V. N. HOLDERMAN & SONS, INC.

890 Oakland Park Avenue — Telephone AMherst 8-3505

COLUMBUS 24, OHIO

FOR SALE

Noble Cement and Concrete Batching Plant as follows:

1—150-ton, 4-compartment Aggregate Bin
1—2-yd. wt. Hopper with Central Cement Compartment
1—2000 cu. ft. Round Bulk Cement Silo
1—12"x7" Bucket Elevator for Cement
1—12" Cement Feed Screw
1—Water Tank 180 gal.
1—Gathering Hopper
1—Control Panel Board for Electrical Equipment
1—5 HP Air Compressor and Receiver
1—12" Screw Under Track Cement Screw Conveyor
1—Mack Truck with 5-yd. Challenger "Peacemaker" Mixer
2—Ford Trucks with 3-yd. Willard Mixers

Call or Write G. H. Mayes, Purchasing Agent, Ph. 2261

THE BUNKER HILL CO.

KELLOGG, IDAHO

FOR SALE

Construction Equipment Business located in New England. Tremendous opportunity for right person. $40,000.00 required. Box 1206, Roads and Streets. 22 W. Maple St., Chicago 10, Ill.

FOR SALE

1—Mod. 120-B Bucyrus Erie Comb. Shovel and Dragline. Electric. Has 5 cu. yd. and 6 cu. yd. Shovel Buckets and 100' Drag. Boom.
Price, f.o.b. Cars, Dallesport, Wash. $80,000.00

1—Mod. 80-D Northwest Dragline powered by Murphy Diesel Engine, 60' Drag Boom.
Price, f.o.b. Cars, Long Beach, Calif. $23,500.00

GUY F. ATKINSON COMPANY

10 W. Orange Avenue — So. San Francisco, Calif.

Phone: PLaza 6-0300

ARMY SURPLUS CRANES

OSGOOD 805 #3411 Crawler Crane-Clamshell, 1½ yard, powered with a Cat D-13000 Diesel with 50' Boom. Used only 650 hours.
F.O.B. $18,000.00
(Backhoe available)

OSGOOD 705 #3549 Crawler Crane-Clamshell, 1¼ yard, powered with a Buda Diesel, with 45' Boom. Near new condition.
F.O.B. $15,500.00

LINKBELT K-370 #2268 Crawler Crane-Clamshell, 1¾ yard, powered with a Cat D-13000 Diesel with 50' Boom. Used 870 hours.
F.O.B. $19,000.00

UDELSON TRUCK SALES,

SUperior 1-1666

3210 Woodland — Cleveland, Ohio

Asphalt and Petroleum trailers for sale.

Also 25-ton low-boys. Good buys.

Contact Gingerich, 1026 So. Riverside Drive, Iowa City, Iowa. Phone 8-3691 or 4719.

FOR SALE

Northwest Model 6 Shovel, 1½ Yard, mounted on 27" treads, with Murphy Model 20 Diesel Engine, Serial No. 18372. New January, 1957. Excellent condition.

McCLUNG-LOGAN EQUIP. CO.

4601 Washington Blvd.

Baltimore 27, Maryland

CYLINDER HEAD REBUILDING SERVICE

CRACKS REPAIRED
MACHINED READY-TO-INSTALL
VALVE GRINDING
PRESSURE AND MAGNETIC TESTING
INTERNATIONAL
CATERPILLAR
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etc.
GAS AND DIESEL

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9 miles west of Jacksonville in CHAPIN, ILL. (Morgan County) PHONE #3

3 BEST BUYS

Subject to Prior Sale

1—Used 5½-yd. Transit Mix on Sterling Diesel Chassis.

1—Used Earth Boring Machine complete with Body, Fore & Aft Travel, Turntable, Pole Setting Mast, Hydraulic Winch, Mounted on Marmon-Herrington All-Wheel-Drive Chassis.

1—Used 4-Wheel-Drive Line Truck, including Tripods, Winch and Special Lights.

CONSTRUCTION EQUIPMENT CO., INC.

457 Windsor Ave., Wilson, Conn.
P. O. Box 671, Hartford 1, Conn.
CHapel 9-5859

We do a Nation-Wide business in

STEEL SHEET PILING

FOR SALE OR RENT

1750 pcs.	56 to 40 ft. Conv. MP-101	New York
168 pcs.	101 ft. Both. SP-4	West Va.
428 pcs.	60 to 35 ft. Conv. MP-110	Illinois
140 pcs.	80 & 56 ft. Both. AP-2	New York
100 pcs.	80 & 50 ft. Conv. MP-115	Indiana
243 pcs.	80 ft. MP-110 & MP-115	Tennessee
383 pcs.	48 to 35 ft. Z-27 & Z-32	Louisiana
885 pcs.	48 to 40 ft. Z-22 & Z-27	Maryland

Other lengths and sections at other locations including storage yards at BUFFALO - BALTIMORE - NEW ORLEANS - MEMPHIS - CHICAGO.

McKiernan-Terry and Vulcan Pile Hammers and Extractors Construction and Railroad Equipment

We are as close as your telephone—you can obtain Steel Sheet PILING BY DIALING CHestnut 1-4474, St. Louis, MO. COLLECT.

MISSISSIPPI VALLEY EQUIPMENT CO.
1906 Railway Exchange Bldg.
St. Louis 1, Mo. CHestnut 1-4474

FOR SALE

1956 Allis Chalmers Tracto Shovel, 1½ yd. Bucket, Model H.D.6 - TS-6, only 1600 hours.

1955 Unit Diesel ½ yd. Model 614 Backhoe, Excellent Condition.

1953 Unit Model 614 ½ yd. Gasoline Backhoe. Motor never opened

(Backhoe attachment only) Michigan ⅜ yd., Model T6K-26" P&M Bucket.

Schramm 60 cu. ft. Fordair Compressor, Trailer Mounted.

All above equipment Purchased new by us and will be sold direct to user at sacrifice prices.

See DICK HAMILTON
813 6 Ave., - Phone OW 53144
ALtoona, Pennsylvania

FOR SALE

PETTIBONE **UNIVERSAL WOBBLER**

FEEDS AND SCALPS IN ONE OPERATION

Won't clog in wet, sticky material

Size 6' x 17' with 13 NI-Mang. Bars used for road base - Chicago Skyway.

Save over 50% on this like-new machine.

Man. Rep. Price $54,000.
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6-Cyl. Gasoline Motors, 404 cubic inch, 105 BHP Adaptable to Rollers, Cranes, Shovels, Boats. Complete with starter, Generator, Carburetor, Governor, 12-Volt Electrical System. Fan to Flywheel.

REBUILT FOR USAF AND CRATED FOR EXPORT

F.O.B. YARD $345.00 EACH

UDELSON TRUCK SALES, INC.

3210 Woodland SUperior 1-1666 Cleveland, Ohio

Schield Bantam Cranes

On Half Track, Hoe and Crane.. $3,750.00

On 200 Bantam Carrier, Late Model $7,950.00

On Half Track, Dragline $4,950.00

Insley Swamp Cat Crawler Dragline, like new $12,500.00

Hoe fronts for Insley, Quickway, Bantam ..... $250.00 up

Half and ¾ drag, clam buckets. One yard concrete bucket.

GENERAL Equipment and Machine Co.

511 E. Colfax, South Bend, Indiana

REDUCING RENTAL FLEET STEEL ERECTION CRANES

2000 MANITOWOC
25 Ton Capacity
40 Ft. IND. BOOM $11,500.00

TRUCK CRANES
$13,500.00 each

2 BROWNING 20 Ton Capacity
HENDRICKSON 3 AXEL TRUCK
35' BOOM, MANY EXTRAS

RIGID INSPECTION INVITED.

DONALD B. MacNEAL, INC.
12100 S. Loomis St. - Chicago 43, Ill.
Telephone: PUllman 5-5040

FOR SALE

LATE MODELS MIDWEST LOCATIONS

Manitowoc 3000-B's, 3500's erect cranes—shovels, long booms, wide long cats diesels. Also 2000-B's.

Northwest 6's, 80-D's, and 95 cranes—drags—shovels, diesels, wide long cats—long booms. Ind. BH's.

Bucyrus-Erie 38-B's, 51-B's, 54-B's, cranes—drags, shovels, diesels, wide long cats—long booms.

Marion, Koehring, Link Belt & Lorain model cranes—drags—shovels, wide long cats—diesels. Also backhoe equipped machines, all types.

JAMES C. FRENCH
P. O. Box 188
228 Berry Pkwy. - Talcott 3-4927
PARK RIDGE, ILLINOIS

BAILEY BRIDGES

Sectional Steel Truss Type
Portable - Fully Prefabricated
Variable Span and Capacity
Cantilever Erection
Expert Construction Supervision

RENTALS or SALES

BAILEY BRIDGE EQUIPMENT COMPANY
1767 Conejo Ave., San Luis Obispo, Calif.

With the Manufacturers and Distributors

Euclid Ads Win Award

An advertising and merchandising program on Twin-Power Scrapers of Euclid Division of General Motors has received a top award in a competition sponsored by National Industrial Advertisers Association. Entries by advertisers in the industrial field were judged on the basis of market analysis, coordination of the merchandiisng program and documentation of the results attained. Presentation was made during the recent NIAA annual convention to Ralph E. Keidel, Euclid advertising manager, and to A. W. Lehman of Richard T. Brandt agency, Cleveland.

This is the second consecutive year that Euclid merchandising material has received a NIAA award. Several of the advertisements in the program have appeared in this publication.

LLOYD F. STANSBURY has been made west coast supervisor for the Construction Materials Division, John A. Roeblings's Sons Corp., replacing the late Robert J. Cole. The division specializes in tensioning materials for prestressed concrete. The Roebling firm is a susidiary of the Colorado Fuel and Iron Corp.

CLEAVER-BROOKS COMPANY has broadened its organization by the formation of five sales districts as follows—Milwaukee, Wis., R. W. Watson, Manager; Atlanta, Ga., Frank R. Goulding, Manager; Dallas, Texas, R. E. Costin, Manager; San Francisco, Calif., W. B. Stoehr, Manager, New York City, Manager still to be named.

GAR WOOD LOS ANGELES TRUCK EQUIPMENT, INC., is the new distributor in the Los Angeles area for the Gar Wood-St. Paul line of truck equipment, which includes hydraulic hoists, "Load-Packer" refuse collection bodies and "Pax-All" refuse containers, as well as heavy-duty dump truck bodies, hopper bodies, elevating end-gates, winches, and truck mounted cranes.

THE EXPANSION JOINT INSTITUTE has announced the election of Mr. Wallace C. Fischer to the board of directors and office of president. The election of new officers was held during the recent annual meeting of the Institute. Mr. Fischer is the President of Servicised Products Corporation, Chicago, Ill. Others newly elected by the institute are: William E. Hagemeister, Prestite-Keystone Engineering Products Co., director and vice president; H. G. Meadows, W. R. Meadows, Inc., director and treasurer; F. W. Lagerquist, The Celotex Corp., director.

J. L. RITCHIE has resigned from the Board of Aveling-Barford Ltd., England, to take up an appointment with Consolidated Pneumatic Tool Company Ltd. G. M. Warren has been appointed to the company's board, and W. Morris and E. B. Watkin to the firm's local board.

GUTHRIE MACHINERY COMPANY, Portland, Oregon, has been formed by C. J. Guthrie as a distributor of new and used equipment throughout the Northwest. The firm will handle many of the low volume lines.

CATERPILLAR TRACTOR CO. has announced the following promotions: Vice President Gail E. Spain to President of the Company's Foreign Trade Group; J. R. Munro, Director of Manufacturing for Foreign operations, to Vice President; and W. K. Cox, Manager of Sales Promotion, to Vice President.

AUSTIN K. THOMAS joined Blaw-Knox Company on July First, as general manager of the Construction Equipment Division. In his newly created position, Mr. Thomas will have responsibility for sales, market planning, and advanced engineering of the company's line of construction and road building equipment.

JOHN P. CARTWRIGHT has been elected Vice President and General Manager of the Industrial Division of Joy Manufacturing Company.

New York and the HOTEL New Yorker
34th Street at 8th Ave.
just naturally go together

New York's largest and most conveniently located skyscraper hotel. 2500 outside rooms, all with bath and free radio. 100% television available. Meditation Chapel open to all faiths. Direct tunnel connection to Pennsylvania Station. Facilities from 100 to 1,200 for banquets, special functions and private meetings.

THREE POPULAR RESTAURANTS
Lamp Post Corner · Golden Thread Cafe · The Coffee House

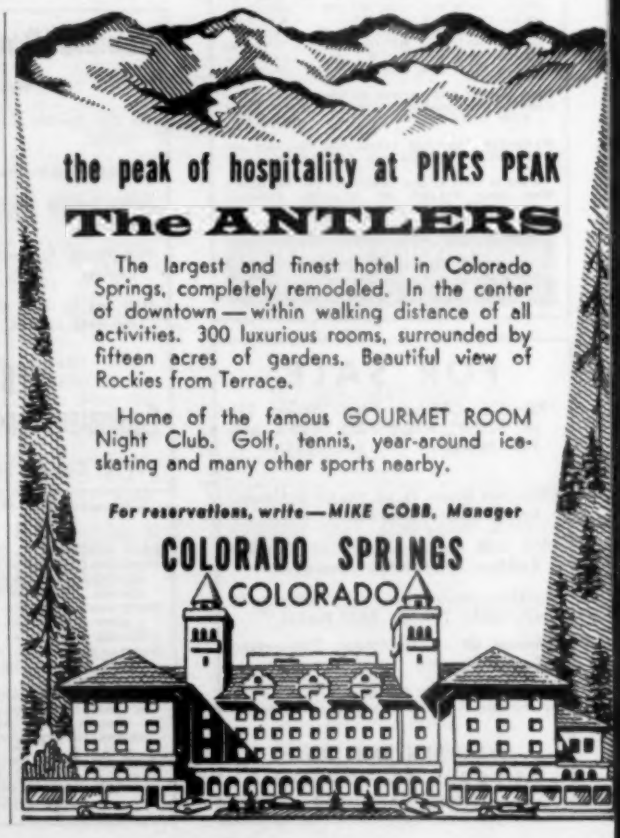
Singles from $7 · Doubles from $11 · Suites from $23

JOSEPH MASSAGLIA JR., President · CHARLES W. COLE, Gen. Mgr.

ACROSS THE U.S.A. and in HAWAII

SANTA MONICA, CALIF. Hotel Miramar
SAN JOSE, CALIF. Hotel Sainte Claire
LONG BEACH, CALIF. Hotel Wilton
GALLUP, N.M. Hotel El Rancho
ALBUQUERQUE, Hotel Franciscan
HONOLULU Hotel Waikiki Biltmore
WASHINGTON, D.C. Hotel Raleigh
HARTFORD, CONN. Hotel Bond
CINCINNATI, O. Hotel Sinton
PITTSBURGH, PA. Hotel Sherwyn
DENVER, COLO. Hotel Park Lane
NEW YORK CITY Hotel New Yorker

World famed hotels—Teletype service—Television



the peak of hospitality at PIKES PEAK

The ANTLERS

The largest and finest hotel in Colorado Springs, completely remodeled. In the center of downtown — within walking distance of all activities. 300 luxurious rooms, surrounded by fifteen acres of gardens. Beautiful view of Rockies from Terrace.

Home of the famous GOURMET ROOM Night Club. Golf, tennis, year-around ice-skating and many other sports nearby.

For reservations, write—MIKE COBB, Manager

COLORADO SPRINGS
COLORADO

Better Control of Striping

A new device for intermittent marking of streets and roads is reportedly proving highy successful in tests. Heretofore, retracing existing intermittent lines and adjusting cycles in transit have been vexing problems to the traffic engineer and maintenance man. This device, the SL46 Skipliner developed by Wald Industries, Inc., is specially designed for such work.

The mechanism involves an intricate epicyclic gear tram with a mechanical interlock, assembled in a sealed unit. By manipulating the controls it is possible for the operator to stop the cycle, return the cycle to zero or starting position, advance or retard the cycle indefinitely for exact registration over old lines. It is also possible for the operator to change from a skip to a solid line on curves and return to the skip sequence after the curve has been navigated, by the movement of the same control lever that stops and resets the unit to starting position.

The unit was designed for truck-towed stripers of all makes, but can be adapted for the larger type portable, self-propelled stripers.

Further information is available from Carl Brown, project engineer of Wald Industries, Inc., at Huntingdon, Pennsylvania.

Concrete Pay Quantities

The Virginia highway engineers, according to a note from the Virginia Road Builders Association, deducts the volume of reinforcing steel in calculating the quantities for major concrete structures designed by the department.

The weight of the steel is converted into cubic volume at the rate of 490 lb. per cu. ft., for this deduction. The planned quantities are shown as the net yardage after such deduction.

Sawed Joint Specification by Virginia Highway Department

The Virginia department of highways is planning, in the 1958 specifications, to adopt a new specification for sawed joints in concrete pavements. These joints will be formed by vibrating a groove in the plastic concrete and placing an insert of premolded fiber or other approved material therein prior to the operation of the longitudinal float. The concrete is then finished and cured in the normal manner. Just prior to sealing joints the insert will be removed by dry sawing and the groove filled in the usual manner. The depth of the groove is 2½ in. and the insert is 2¼ in. in depth, so that it is one-quarter inch under the concrete when it is finished. The process will produce hairline cracking across the plane of weakness but such cracks will be eliminated by the sawing operation.

Michigan Plans First Heavy-Duty Asphalt Job

Bids were taken by the Michigan state highway department on a project said to be the first major heavy-duty, dual-lane asphalt pavement on the state primary system.

The project is a 6-mile section of U.S. 31 South of Muskegon. The pavement design includes two 24-ft. roadways of bituminous concrete 4½ in. thick, placed in three courses in a 7-in. crushed stone base or 8-in. stabilized gravel base.

A sub-base 3 in. thick of natural sandy subsoil stabilized with gravel aggregate is also included, and the roadway will have this sub-base from out to out of shoulders.

WHAT ABOUT YOU, MR. READER?

Are you still active in the field? Have you moved or changed your position?
Unless you send this information directly to us we can't be sure. Sometimes a reader's name is cut from the mailing list because we are not sure that our information as to name, title and address is right. *Your* name might be cut from the mailing list.

Don't Let This Happen to You

Even if you think we know all about you, please fill in the information requested below and send to us by return mail. Our auditors require proof of accuracy of our mailing list. *You* are the only person who can help us on this. Do it now before your forget, so you can be sure your magazine will always be properly addressed to you. New names cannot be added or old names retained on our list unless we have *all* this information. *Please print or type.*

ROADS AND STREETS DATE _____

22 WEST MAPLE STREET, CHICAGO 10, ILL.

☐ I do receive ROADS & STREETS and wish to continue to receive it.
☐ I do not receive ROADS & STREETS but would like to have it.

NAME _____

TITLE OR OCCUPATION _____

FIRM NAME OR GOVERNMENT DEPARTMENT (give street address) _____

CITY _____ ZONE (if any) _____ STATE _____

(If you have moved give *old and new* address)

SIGNATURE _____

International Paywagon

Open Water Wagon Made From Big Earth Haulers

Two International bottom-dump Paywagon units were put to special use at the Strategic Air Command jet bomber base at Amarillo, Texas, where a new 13,500-ft. runway was recently built.

The contractor moved four-million cubic yards of material, using 8 International rubber-tired earthmovers, handling 25,000 cu. yd. per 20-hour day. The work necessitated the use of 40,000 gal. of water an hour to meet compaction moisture requirements.

The contractor believed that the normal method of watering with highway-type tank trucks would prove unsatisfactory, and hit on the idea of using the International Paywagon, which proved highly successful. Each of the Paywagon units held 5,418 gal. of water, and capacity could be increased by elevating the sideboards. The machines were loaded to full capacity in 5 minutes through a 10-in. pipe. Unloading took about 10 minutes.

In converting the Paywagon, the bottom-dump section was removed, and 3/16 gauge steel welded to form a water-tight bottom for the tank. Water flow was controlled by the operator through an air-actuated valve. The valve, formerly controlling the bottom-dump, permitted a gate valve mounted on the bottom, rear end of the tank to control water flow through the spray bar. The bar, with a ground clearance of 2 ft., had fifteen 1¼-in. nozzles.

Statistics on Michigan Winter Road Maintenance

The Michigan state highway department has issued data on the upkeep of its trunk line roads in winter. This will take $6,500,000 estimated for the winter just passed.

The department performs maintenance on trunk lines with its own personnel in 15 of the 83 counties, contracting with the counties highway departments to perform maintenance in the other counties.

Over 3,000 men and machines were engaged in the 1957-58 winter highway maintenance, including snow removal and ice control. Over 100,000 tons of rock salt and 13,000 tons of calcium chloride were used.

Snow in Michigan ranges from relatively light in the south up to 161 inches in Houghton County.

Construction Control Job Created In Virginia

A newly created position in the Virginia department of highways is that of construction control engineer. S. F. Stephens has been appointed to this job, taking over from his former position as contract engineer. John M. Townes, Jr., has been appointed to succeed him as contract engineer.

Mr. Stephens, who has been with the department since 1930, will supervise the preparation of wage rates for interstate construction, and the handling of work orders from the field.

JOHN L. MCCAFFERY, chairman of the board and chief executive officer of International Harvester Company, has announced that he will retire from active management of the business in May, after 49 years of service with the company. He will continue to serve as a member of the Board of Directors and of the executive committee of the Board. Frank W. Jenks, president, will succeed McCaffrey as chief executive officer of the company, in his capacity as president.

GEOPHYSICAL SUBSURFACE EXPLORATION

. . . simplified with the Barnes Layer Method

Quick and Accurate . . . direct reading earth resistivity surveys provide soil contour profiles that clearly indicate type, location and depth of individual soil layers.

Earth Resistivity Measuring "MICHIMO" VIBROGROUND®

Model 274M is designed for use with the Barnes Layer Method. Reads soil conductance directly to locate gravel deposits, determine depth of bedrock and water table. Weight only 20 lbs. with self-contained vibrator power supply. Barnes Layer Surveys are readily made by non-technical operators using the VIBROGROUND.

Write for NEW Bulletin:

Just prepared . . . new MICHIMO Application notes on Model 274M. Write today. 1-35.3

ASSOCIATED RESEARCH, Incorporated

3752 W. Belmont Ave. • Chicago 18, Illinois

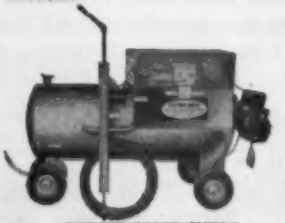
. . . for more details circle 315 on enclosed return postal card

ELECTRO-MAGIC CAR WASHERS SELL FOR ONLY $198.00 F.O.B. FACTORY

ELECTRO-MAGIC Motor Steam Cleaners

Sell for only $329 FOB FACTORY

Fully Automatic



RUBBER TIRES EXTRA

Dealers wanted to sell this unit in your own territory . . . make up to $500 weekly. Order a sample unit and you are ready for business. Literature and details sent on request.

ELECTRONIC'S INC. Vermillion, S. D.

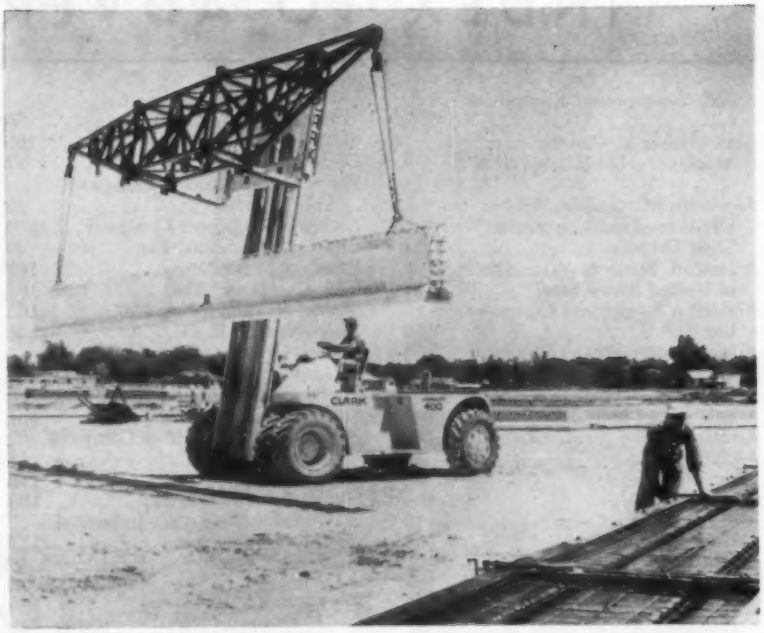
. . . for more details circle 269 on enclosed return postal card

Fork Truck Boom Attachment Handles 80 Ft. Beams

Damage to prestressed concrete double-tee and channel slabs, caused when the members were stripped from permanent pouring forms, has been eliminated by use of a specially-rigged fork truck at Dura-Stress, Inc., Leesburg, Florida.

Previously members were removed from forms with a truck crane. When bond between the member and mold was broken the sudden shock caused a rebound action, bumping the member against the form. In many lifts made in this manner the member was chipped or cracked. Repair of damage was time consuming and costly.

Now lifts are made damage free with a Clark fork truck fixed with a boom attachment capable of carrying structural shapes 80 ft. long. The boom itself is 36 ft. long, made of tubular steel and angle iron bracing. Sleeves on the bottom receive the truck's forks. Adjustable slings hanging from each end of the boom lift the members through hook-eyes imbedded in the concrete.



● **Fork truck boom attachment used by Dura-Stress, Inc.**

With the attachment, which was fabricated by Dura-Stress, the fork truck, a CY-400 of 40,000 lb. capacity, services the company's 11 casting beds.

Economic and Safety Advantage of Controlled Access Highways

The dollar value of the life saving that attends when a highway is fully access controlled is illustrated by a Massachusetts example. According to Paul F. Royster, assistant to the Federal Highway Administrator, speaking before the annual convention of the Asphalt Institute, two comparable highways with similar daily traffic were compared. Each of these roads carried over 28,000 vehicles per day. The accident cost was $82,000 per mile for the one without controlled access, and only $19,000 per mile per year for the controlled access facilities.

This economic saving is over and above the saving of lives, figures for which were not given in this instance.

Oregon Has Effective Engineer Career Program

A Career Development Program for graduate civil engineers was inaugurated by the Oregon State Highway Department in June this year. The outgrowth of an informal on-the-job training program, this more formally organized program gives selected young engineers a systematic rotation and experience at different assignments.

At completion of time in each division, the graduate will submit a written report on his observations, experiences, relations to the practical job at hand, constructive criticisms, etc.

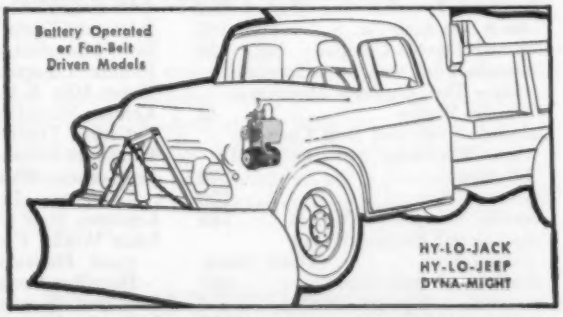
The initial program includes a work-study schedule comprising working day periods ranging from 15 days to 65 day in construction, field work, bridges, traffic, research, office engineering, maintenance and materials.

LIFT SNOW PLOWS ... automatically

Lift or lower your snow plow automatically! One man operates the plow right from the truck or jeep cab. Instant action! Snow removal is easier, faster, more efficient. See your dealer or write for full information.

MONARCH CONTROLS

MONARCH POWER HYDRAULIC CONTROLS



MONARCH ROAD MACHINERY COMPANY
1331 Michigan St., N.E. — Grand Rapids 3, Michigan

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(Photo courtesy Lukens Steel Co., Coatesville, Pa.)

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